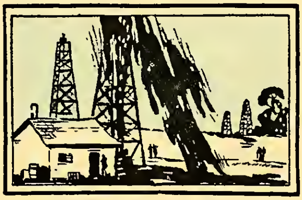
Louisiana Conservation REVIEW



Observations on Alligator

Fertilizing Shade Trees

Shrimp Recipes

Probable Cause of "Iodine Shrimp"

Published Monthly by the
DEPARTMENT OF CONSERVATION

DECEMBER
1931

Rich in - - -

Raw Materials

Louisiana is rich in natural resources . . . timber, salt and sulphur . . . cotton . . . cane . . . rice . . . oil and an ABUNDANCE OF NATURAL GAS. Manufacturers seeking sites for new ventures or new locations for old ones find all their perplexing problems settled in the Pelican State. For not only do its resources offer every possible inducement, but its splendid railroads and highways make distribution easy. The Arkansas Louisiana Pipeline Company and the Arkansas Fuel Oil Company, because of their faith in this territory, are keeping in line with Louisiana's progressive march by developing natural resources.

Arkansas Fuel Oil Company
Arkansas Louisiana Pipeline Co.
CITIES SERVICE UNITS

Natural Gas---

The Ideal Servant

INDEED fortunate is the community where an abundant supply of Natural Gas—the Modern Fuel—is available for home and factory.

Not only does this 24-hour-a-day servant lighten the burden of daily household duties—cooking, water-heating and house-heating—but it serves to attract new residents and new enterprises to the favored section.

The growth and prosperity of this area is of vital concern to us, and we are constantly planning and working to keep a pace ahead of every fuel demand.

United Gas Public Service Company

A Unit of the United Gas System

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VOL. II. NEW ORLEANS, LA., DECEMBER, 1931 NO. 3

Louisiana Advertised Nationally

THE State of Louisiana received wide and favorable advertising of its natural resources in Detroit, Michigan, at the National Convention of the American Legion among the hundreds of thousands of visitors of every section that thronged the city. The Louisiana Conservation loaned the Louisiana Department of the American Legion a large and valuable collection of stuffed birds, alligators, and wild life, and a fine display of the natural resources of the state.

Capt. Verne C. Amberson, Assistant Prosecuting Attorney of Detroit, Chief Aide to the Louisiana Department, assigned by the American Legion National Convention Corporation, procured a large window in the Crowley-Milner Store, largest and most prominent department store in Detroit, for the Louisiana Exhibit and Display. Special window dressers co-operated, and the Louisiana window was the "show place" of the store, and the space around it was crowded with men, women, and school children, day and night.

Wilbur P. Kramer, Administrative Vice Commander of the Louisiana Department, and in charge of the Display at Detroit, used for background to the Louisiana window, large sugar cane stalks with leaves and sheaths of rice in natural state. These were placed standing; so as to give a natural background of a sugar cane and rice field. The stuffed pelican, birds, alligators, and the many other items in the Display, were artistically arranged, with native Spanish moss in the "wings of the window." Appropriate window signs of an educational nature were added.

The Detroit Free Press and Times gave considerable space in their papers, during the Convention, to the Louisiana Display, and thousands appeared at all hours to view it.

Louisiana was the only State having a display, but the Louisiana window was so well received, and attracted so much favorable comment, that Legion officials of Florida and other states stated that they intended to adopt the Louisiana plan of state advertising at the next and future National Conventions.

Carrying out its plan of advertising Louisiana, the Louisiana Delegation at Detroit entered a sound float of a Louisiana radio station mounted on a map of Louisiana, displayed on a globe of the world. Five large amplifiers, hidden in the float, broadcasted to the world, Louisiana and Southern melodies, and a station announcement advertising the State of Louisiana. One of Louisiana's official cars followed, with four members of the Louisiana Auxiliary, giving out souvenir bags of rice, sugar, and salt, and samples of celotex, cotton, moss, hard wood lumber, and other Louisiana products. Delegates followed wearing a blue sweater with the State seal showing our native pelican. Louisiana French dripped coffee was served during the Convention to thousands of visitors at Louisiana Department Headquarters in the Book-Cadillac Hotel in Detroit.

Louisiana Conservation Review

Published monthly by the Department of Conservation in the interest of protection and proper utilization of Louisiana's natural resources.

JAMES P. GUILLOT . . . . Editor
N. E. SIMONEAUX . . Assoc. Editor
WM. G. RANKIN . . Business Mgr.

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"Have You Eaten Your Iodine Today?"

TEN years ago the answer would have been: "I'm not trying to commit suicide"—today every housewife knows that iodine is present in the body, and if the supply is not kept up to normal, goiter is the result. Experiments have proved that goiter can be avoided in the "goiter belt" of our country—the inland sections where salt breezes never blow—for many of our easily available foods contain iodine in sufficient quantities for protection, wthout the addition of any chemicals.

One of these foods is the shrimp, long considered by the epicureans of the South as a delicacy. How does all the iodine get in the shrimp? The many rivers of the country, as they flowed seawards throughout the years, have carried the iodine of the soil with them. It is in the Gulf of Mexico that a large proportion of iodine is stored. Since the Gulf is warmer than either the Atlantic or Pacific Oceans, it holds a greater amount of iodine in solution. And along the sunny shores of the Gulf of Mexico, shrimp have taken up their abode. Here they gather in large schools and assimilate the iodine in the water. Besides containing iodine, shrimp contain a great deal of protein, necessary for building. One hundred calories of shrimp are 91% protein, 8% fat, and 1% carbohydrates. So you who are fond of eating, and who want at the same time to control your weight, can eat shrimp with an easy conscience.

New Preserve Ready Soon

Great Game, Fish Hatchery Will Be Yule Gift to Fishermen

WITH funds accumulated by economies and by the efficient administration of the Department of Conservation, Louisiana is to be made into a paradise for hunters and fishermen, without a cent of additional taxation from the people of the state, it became known Saturday when Conservation Commissioner Robert S. Maestri announced that the first of three new great game and fish hatcheries will be completed in December, and dedicated as a Christmas present to the sportsmen of Louisiana.

This new hatchery for game and fish, known as the Northwest Louisiana Game and Fish Preserve, occupies 23 square miles, and is in Winn and Natchitoches parishes, on Black, Saline and Clear lakes.

Work on the preserve was started by Commissioner Maestri 30 days ago, and it will be completed and dedicated before Christmas, he said. It will cost about $75,000.

BUSINESS ADMINISTRATION

The building of this preserve, and of two others which are to be completed at a later date, was made possible through the business administration of the affairs of the Conservation department, inaugurated when Commissioner Maestri took charge of the office.

The Conservation department, which has special appropriations from the general fund of the state for the operation of certain of its departments, also obtains considerable revenue from other sources.

The department is charged with the collection of hunting and fishing licenses, and with the collection of severance taxes for certain minerals, sea foods, oysters, and other things.

Rigid enforcement of these collections, with certain economies effected in the operation of the department, left a cash balance of $250,000 to the credit of the department over its operating costs, at the end of the fiscal year, on June 30, Commissioner Maestri revealed.

AUTHORIZED BY LAW

In 1928, an act of the legislature was passed authorizing the building of the Northwest Louisiana Game and Fish Preserve, but that law provided it could only be built out of money saved by the Conservation department.

Therefore, with his accumulated savings, Commissioner Maestri began to devise plans for the completion of this, and other preserves. A big dam was built to conserve the waters of Saline, Clear, and Black lakes, and to make this 23 square miles into a perpetual breeding place, and a home for the game fish of Louisiana.

A hunting club, with all modern conveniences and facilities for use of both fishermen and hunters, will be added to make this spot one of the most attractive hunting and fishing preserves in the world, Commissioner Maestri explained. He said that fishermen and hunters will only be allowed to avail themselves of privileges on the preserve during certain brief periods each year, and that the preserve will be policed and safeguarded against poachers during the rest of the time.

"Every section of Louisiana will benefit through our plans for the remainder of 1931 and during the coming year," Commissioner Maestri said. "We have not asked the state treasury for one cent of additional money. We don't have to, although we have three major projects and innumerable minor ones under way or about to start. When we have paid for them all, we will still have money in the bank, and it will not have cost the people of the state one cent," he said.

TWO OTHER PRESERVES

Another of the preserves will be created on Bayou Lacombe, to serve the Florida parishes. It will cover about 20 acres, and will cost about $20,000, Commissioner Maestri said.

The third major preserve will be located in Ouachita parish and will also cost about $20,000. This preserve will be used to stock streams in north and north-central Louisiana. He said work on the Bayou Lacombe preserve would be begun within 60 days.

Another of the contemplated preserves is to be near Alexandria, the Rapides police jury having expressed a desire to co-operate with the department in obtaining a preserve in that parish. Commissioner Maestri said that work on this one may not start for several months, but announced that the Conservation department would spend dollar for dollar with the parish in building and equipping the hatchery.

Another enterprise undertaken by the department, out of its accumulated savings, will be the construction of another preserve on Lake Bistineau, in the parishes of Bienville, Bossier, and Webster, just south of the paved Dixie-Overland highway.

This preserve will cost $35,000, and will be completed sometime during the middle of 1932, Commissioner Maestri estimated. Thousands of fish will be hatched in the new preserves, which, in addition to furnishing material to the delight of hundreds of fishermen's hearts, will be used to stock streams and waterways throughout the State, in which excessive fishing or some other cause has depleted of fish.

When the Maestri program of expanding the fish and game preserves of Louisiana has been completed, out of surplus funds accumulated by the economical operation of the department, more than $1,000,000 will have been added to the commercial value of the fish and game life of Louisiana, and innumerable hours of exciting pleasure will have been stored up to be enjoyed by future generations of sportsmen, Commissioner Maestri said—New Orleans **Item**, Oct. 25, 1931.

Observations on the Natural History of the Alligator

In a Letter to Sir William Jardine, Baronet, and Prideaux John Selby, Esq., by John J. Audubon, Esq., Member of the Wermerian Natural History Society, etc.

The Edinburgh New Philosophical Journal, October, 1826 — April, 1827, a quarterly, conducted by Robert Jameson, Page 270. Mr. Audubon *On the Natural History of the Alligator.*

MY DEAR SIRS:

One of the most remarkable objections connected with the Natural History of the United States, that attracts the traveller's eye, as he ascends through the mouths of the mighty sea-like river Mississippi, is the Alligator. There, along the muddy shores, and on the large floating logs, these animals are seen, either lying basking and asleep, stretched to their full length, or crossing to and fro the stream, in search of food, with only the head out of water. It is here neither wild nor shy, neither is it the very dangerous animal represented by travellers. But, to give you details that probably may not be interesting to you, I shall take you to their more private haunts, and relate what I have experienced, and seen, respecting them and their habits.

In Louisiana, all lagoons, bayous, creeks, ponds, lakes, and rivers, are well stocked with them,—they are found wherever there is a sufficient quantity of water to hide them, or to furnish them with food, and they continue thus, in great numbers, as high as the mouth of the Arkansas River, extending east to North Carolina, and as far west as I have penetrated. On the Red River, before it was navigated by steam-vessels, they were so extremely abundant, that, to see hundreds at a sight along the shore, or on the immense rafts of floating or stranded timber, was quite a common occurrence, the smaller on the backs of the larger, groaning and uttering their bellowing noise, like thousands of irritated bulls about to meet in fight, but all so careless of man, that unless shot at, or positively disturbed, they remained motionless, suffering boats or canoes to pass within a few yards of them, without noticing them in the least. The shores are yet trampled by them, in such a manner that their large tracks are seen as plentiful as those of sheep in a fold. It was on that river particularly that thousands of the largest size were killed, when the mania of having either shoes, boots, or saddle-seats, made of their hides, lasted. It had become an article of trade, and many of the squatters, and strolling Indians, followed, for a time, no other business.

The discovery that the skins are not sufficiently firm and close-grained, to prevent water

A cow alligator watching her young hatch from the nest she has constructed on the side of a Louisiana bayou.—
—From a water color painting by G. L. Viavant.

or dampness long, put a stop to their general destruction, which had already become very apparent. The leather prepared from these skins was handsome and very pliant, exhibiting all the regular lozenges of the scales, and able to receive the highest degree of polish, and finishing.

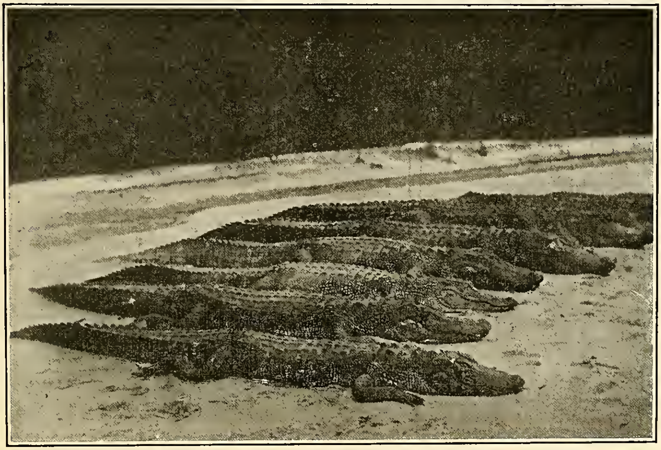
The usual motion of the alligator, when on land, is slow and sluggish; it is a kind of laboured crawling, performed by moving alternately each leg, in the manner of a quadruped when walking, scarce able to keep up their weighty bodies from dragging on the earth, and leaving the track of their long tail on the mud, similar to that of the keel of a small vessel. Thus they emerge from the water, and go about the shores and the woods, or the fields, in search of food, or of a different place of abode, or one of safety to deposit their eggs. If, at such times, when at all distant from the water, an enemy is perceived by them, they droop and lie flat, with their eyes, apparently half-closed. These are able to move around considerably, without affecting the position of the head. Should a man then approach them, they do not attempt either to make away or attack, but merely raise their body from the ground for an instant, swelling themselves, and issuing a dull blowing sound, not unlike that of a blacksmith's bellows. Not the least danger need be apprehended; then you either kill them with ease or leave them. But, to give you a better idea of the slowness of their movements and progress of travels on land, when arrived at a large size, say 12 to 15 feet, believe me when I tell you, that, having found one in the morning, 50 yards from a lake and going to another, in sight, I have left him unmolested, hunted through the surrounding swamps all the day, and met the same alligator within 500 yards of the spot, when returning to my camp at dusk. On this account, they usually travel during the night, being then less likely to be disturbed, and having a better chance to surprise a litter of pigs, or of land-tortoises, for prey.

Gaitor hunters demonstrating the capacity of the mouth of the big fellow they have just secured.

The power of the alligator is in his great strength; and the chief means of his attack or defense is his large tail, so well contrived by nature to help him supply his wants, or guard him from danger, that it reaches, when curved into half a circle, his enormous mouth. Woe be to him who goes within the reach of this tremendous thrashing instrument, for no matter how strong or muscular, if human, he must suffer greatly, if he escapes with life. The monster, as he strikes with this, forces all objects within the circle towards his jaws, which, as the tail makes a motion, are open to their full stretch, thrown a little sidewise, to receive the object, and, like battering-rams, to bruise it shockingly in a moment.

The alligator, when after prey in the water, or at its edge, swims so slowly towards it, as not to ruffle the water. It approaches the object sidewise, body and head all concealed, till sure of his stroke; then, with a tremendous blow, as quick as thought, the object is secured, as I described before.

When alligators are fishing, the flapping of their tails about the water may be heard at half a mile; but, to describe this in a more graphic way, suffer me to take you along with me, in one of my hunting excursions, accompanied by friends and negroes. In the immediate neighborhood of Bayou Sara, on the Mississippi, are extensive shallow lakes and morasses, that are yearly overflowed by the dreadful floods of that river, and supplied with myriads of fishes of many kinds, amongst which are most abundant trout, white-perch, cat-fish, and alligator-gars, or devil-fish. Thither, in the early part of autumn, when the heat of a southern sun has exhaled much of the water, the squatter, the planter, the hunter, all go in search of sport. The lakes are then about two feet deep, having a fine sandy bottom; frequently much grass grows in them, bearing crops of seeds, for which multitudes of water-fowl resort to those places. The edges of these lakes are deep swamps, muddy for some distance, overgrown with heavy large timber, principally cypress, hung with Spanish beard, and tangled with different vines, creeping plants and cane, so as to render them almost dark during the day, and very difficult to the hunter's progress. Here and there in the lakes are small islands, with clusters of the same trees, on which flocks of snake-birds, wood-ducks, and different species of herons, build their nests. Fishing-lines, guns, and rifles, some salt and some *water*, are all the hunters take. Two negroes precede them — the woods are crossed — the scampering deer is seen,—the raccoon and the opossum cross before you,—the black, the grey, and the fox squirrel, are heard barking,—here on a tree close at hand, is seen an old male, pursuing intensely a younger one; he seizes it, they fight desperately, but the older attains his end, *vincit, castratque, juniorem.* (Now, my dear sirs, if this is not mental power illustrated, what shall we call it?) As you proceed farther on, the *hunk hunk* of the lesser ibis is heard from different parts, as they rise from the puddles that supply them with cray-fishes. At last the opening of the lake is seen; it has now become necessary to drag one's self along through the deep mud, making the best of the way, with the head bent, through the small bushy growth, caring about naught but the lock of your gun. The long narrow Indian canoe kept to hunt those lakes, and taken into them during the freshet, is soon launched, and the party, seated in the bottom, is paddled or poled in search of water-game. There, at sight, hundreds of alligators are seen dispersed over all the lake, their heads, and all the upper part of the body, floating like a log, and, in many instances, so resembling one, that it requires to be accustomed to see them to know the distinction. Millions of the large wood-ibis are seen, wading through the water, mudding it up, and striking deadly blows with their bills on the fish within. Here are a hoard of blue herons,—the sand-hill-crane rises, with his hoarse note, — the snake-birds are perched here and there on the dead timber of the trees,—the cormorants are fishing,—buzzards and carion-crows exhibit a mourning train, patiently waiting for the water to dry, and leave food for them, — and, far in the horizon, the eagle overtakes a devoted wood-duck, singled from the clouded flocks that have been bred there. It is then that you see and hear the alligator at his work —each lake has a spot deeper than the rest, rendered so by those animals who work at it, and always situated at the lower end of the lake, near the connecting bayous, that, as drainers, pass through all those lakes, and discharge sometimes many miles below where the water had made its entrance above, thereby ensuring to themselves water as long as any will remain. This is called by the hunters the Alligator's Hole. You see them there, lying close together. The fish, that are already dying by thousands, through the insufferable heat and stench of the water, and the sounds of the different winged enemies constantly in pursuit of them, resort to the Alligator's Hole, to receive refreshment, with a hope of finding security also, and follow down the little currents flowing through the connecting sluices; but, no! for, as the water recedes in the lake, they are here confined. The alligators thrash them and devour them whenever they feel hungry, while the ibis destroys all that make towards the shore. By looking for a little while on this spot, you plainly see the tails of the alligators moving to and fro, splashing, and now and then, when missing a fish, throwing it up in the air. The hunter, anxious to



Over 21,000 alligators were taken for their hides during the 1924 season and, as it has been outlawed in the coastal parishes, its numbers have been alarmingly decreased.

prove the value of his rifle, marks one of the eyes of the largest alligator, and, as the hair-trigger is touched, the alligator dies. Should the ball strike one inch astray from the eye, the animal flounces, rolls over and over, beating furiously with his tail all about him, frightening all his companions, who sink immediately, whilst the fishes, like blades of burnished metal, leap in all directions out of the water, so terrified are they at this uproar.*

Another and another receives the shot in the eyes, and expires; yet those that do not feel the fatal bullet, pay no attention to the death of their companions, till the hunter approaches very close, when they hide themselves, for a few moments, by sinking backward.

So truly gentle are the alligators at this season, that I have waded through such lakes in company with my friend, Agustin Bourgeat, Esq., to whom I owe much information, merely holding a stick in one hand to drive them off, had they attempted to attack me. When first I saw this way of traveling through the lakes, waist-deep, sometimes with hundreds of these animals about me, I acknowledge to you that I felt great uneasiness, and thought it fool-hardiness to do so; but my friend, who is a most experienced hunter in that country, removed my fears by leading the way, and, after a few days, I thought nothing of it. If you go towards the head of the alligator there is no danger, and you may safely strike it with a club, four feet long, until you drive it away, merely watching the operations of the point of the tail, that, at each blow you give, thrashes to the right and left most furiously.

The drivers of cattle from the Oppelousas, and those of mules from Mexico, on reaching a lagoon or creek, send several of their party into the water, armed merely each with a club, for the purpose of driving away the alligators from the cattle; and you may then see men, mules, and those monsters, all swimming together, the men striking the alligators, that would otherwise attack the cattle, of which they are very fond, and those latter hurrying towards the opposite shores, to escape those powerful enemies. They will swim swiftly after a dog, or a deer, or a horse, before attempting the destruction of man. I have always remarked they are afraid of man if he shows no fear of these reptiles. Although I have told you how easily an alligator may be killed with a single rifle ball, if well aimed, that is to say if it strike either in the eye or very immediately above it, yet they are quite difficult to kill if not shot properly; and, to give you an idea of this, I shall mention two striking facts.

Alligator hide hunters and one night's take. While this characteristic inhabitant of the Louisiana marshes has been charged with being the muskrat industry's worst enemy, field investigations to date have not proved the charge.

My good friend, Richard Harlan, M.D., of Philadelphia, having intimated a wish to have the heart of one of those animals to study its comparative anatomy, I one afternoon went out, about half a mile from the plantation, and seeing an alligator that I thought I could put whole into a hogshead of spirits, I shot it immediately on the skull bone. It tumbled over from the log on which it had been basking into the water, and, with the assistance of two negroes, I had it out in a few minutes, apparently dead. A strong rope was fastened round its neck, and, in this condition, I had it dragged home across logs, thrown over fences, and handled without the least fear. Some young ladies there, anxious to see the inside of its mouth, requested that the mouth should be propped open with a stick put in vertically; this was attempted, but at this instant the first stunning effect of the wound was over, and the animal thrashed and snapped its jaws furiously, although it did not advance a foot. The rope being still around the neck, I had it thrown over a strong branch of a tree in the yard, and hauled the poor creature up, swinging free from all about it, and left it twisting itself, and scratching with its fore-feet to disengage the rope. It remained in this condition until the next morning, when finding it still alive, though very weak, the hogshead of spirits was put under it, and the alligator fairly lowered into it with a surge. It twisted about a little, but the cooper secured the cask, and it was shipped to Philadelphia, where it arrived in course.

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*This so alarms the remaining alligators, that, regularly, in the course of the following night, every one, large and small, removes to another hole, going to it by water and probably for a week not one will be seen there.

Again, being in company with Augustin Bourgeat, Esq., we met an extraordinary large alligator, in the woods, whilst hunting; and, for the sake of destruction, I may say, we alighted from our horses and approached it with full intention to kill it. The alligator was put between us, each of us provided with a long stick to irritate it, and, by making it turn its head partly on one side, afford us the means of shooting it immediately behind the foreleg and through the heart. We both discharged five heavy loads of duck-shot into its body; and almost all into the same hole, without any other effect than that of exciting regular strokes of the tail, and snapping of the jaws, at each discharge, and the flow of a great quantity of blood, out of the wound, and mouth, and nostrils of the animal; but it was still full of life and vigour, and to have touched it with the hand would have been madness; but as we were anxious to measure it, and to knock off some of its larger teeth, to make powder chargers, it was shot with a single ball just over the eye, when it bounded a few inches off the ground, and was dead when it reached it again. Its length was 17 feet; it was apparently centuries old; many of its teeth measured three inches. The shots taken were without a few feet only of the circle that we knew the tail could form, and our shots went *en masse.*

As the lakes become dry, and even the deeper connecting bayous empty themselves into the rivers, the alligators congregate into the deepest hole, in vast numbers; and, to this day, in such places, are shot for the sake of their oil, now used for greasing the machinery of steam-engines, and cotton-mills, though formerly, when indigo was made in Louisiana, the oil was used to assuage the overflowing of the boiling juice, by throwing a ladleful into the kettle whenever this was about to take place. The alligators are caught frequently in nets by fishermen; they then come without struggling to the shore, and are killed by blows on the head, given with axes.

When autumn has heightened the colouring of the foliage of our woods, and the air feels more rarified during the nights and earlier part of the day, the alligators leave the lakes to seek for winter quarters, by burrowing under the roots of trees, or covering themselves simply with earth along their edges. They become then very languid and inactive, and, at this period, to sit or ride on one, would not be more difficult than for a child to mount his wooden rocking-horse. The negroes who now kill them, put all danger aside by separating, at one blow, with an axe, the tail from the body. They are afterwards cut up in large pieces, and boiled whole in a good quantity of water, from the surface of which the fat is collected with large ladles. One single man kills oftentimes a dozen or more of large alligators in the evening, prepares his fire in the woods, where he has erected a camp for the purpose, and by morning has the oil rendered.

I have frequently been very much amused when fishing in a bayou, where alligators were numerous, by throwing a blown bladder on the water the nearest to me. The alligator makes for it at once, flaps it towards its mouth, or attempts seizing it at once, but all in vain. The light bladder slides off; in a few minutes, many alligators are trying to seize it, and their evolutions are quite interesting. They then put one in mind of a crowd of boys running after a football. A black bottle is sometimes thrown, also, tightly corked; but the alligator seizes this easily, and you hear the glass give way under its teeth, as if ground in a coarse mill. They are easily caught by negroes, who most expertly throw a rope over their heads when swimming close to shore, and haul them out instantly.

But, my dear sirs, you must not conclude that alligators are always easily conquered; there is a season when they are dreadfully dangerous; it is during spring, during the love season. The waters have again submerged the low countries; fish are difficult of access; the greater portion of the game has left for the northern latitudes; the quadrupeds have retired to the high lands; and the heat of passions, joined to the difficulty of procuring food, render these animals now ferocious and very considerably more active. The males have dreadful fights together, both in the water and on the land. Their strength and weight adding much to their present courage, exhibit them like colossuses wrestling. At this time no man swims or wades among them; they are usually left alone at this season.

About the first days of June, the female prepares a nest; a place is chosen, forty or fifty yards from the water, in thick bramble or cane, and she gathers leaves, sticks, and rubbish of all kinds, to form a bed to deposit her eggs; she carries the materials in her mouth, as a hog does straw. As soon as a proper nest is finished, she lays about ten eggs, then covers them with more rubbish and mud, and goes on depositing, in different layers, until fifty or sixty, or more, eggs are laid. The whole is then covered up, matted and tangled with long grasses, in such a manner that it is difficult to break it up. Their eggs are the size of that of a goose, more elongated, and, instead of being contained in a shell, are in a bladder, or thin, transparent, parchment-like substance, yielding to the pressure of the fingers, yet resuming its shape at once, like the eggs of snakes and tortoises. They are not eaten, even by hogs. The female now keeps watch near the spot, and is very wary and ferocious, going to the water from time to time, only for food. Her nest is easily discovered, as she always goes and returns the same way, and forms quite a path by the dragging of her heavy body. The heat of the nest, from its forming a mass of putrescent manure, causing the hatching of the eggs, not that of the sun, as is usually believed.

Some European writers say, that at this juncture the vultures feed on the eggs, and thereby put a stop to the increase of those animals. In the United States, I assure you, it is not so, nor can it be so, were the vultures ever so anxiously inclined; for, as I have told you before, the nest is so hard, and matted, and plastered together, that a man needs his superior strength, with a strong, sharp stick, to demolish it.

The little alligators, as soon as hatched (and they all break shell within a few hours from the first to last), force themselves through, and issue forth all beautiful, lively, and as brisk as lizards. The female leads them to the lake, but more frequently into small detached bayous for security's sake; for now the males, if they can get at them, devour them by hundreds, and the wood ibis, and the sand-hill cranes, also feast on them.

I believe, that the growth of alligators takes place very slowly, and that an alligator of twelve feet long, for instance, will most probably be fifty or more years old. My reasons for believing this to be fact is founded on many experiments, but I shall relate to you one made by my friend, Bourgeat. That gentleman, anxious to send some young alligators as a present to an acquaintance in New York, had a bag of young ones, quite small, brought to his house.

They were put on the floor, to show the ladies how beautiful they were when young. One accidently made its way out into a servant's room, and lodged itself, snug from notice, into an old shoe. The alligator was not missed, but, upwards of twelve months after this, it was discovered about the house, full of life, and, apparently, scarcely grown bigger; one of his brothers, that had been kept in a tub of water, and fed plentifully, had grown only a few inches during the same period.

Few animals omit a stronger odour than the alligator; and, when it has arrived at great size, you may easily discover one in the woods in passing fifty or sixty yards from it. This smell is highly musky, and so strong, that, when near, it becomes insufferable; but this I never experienced when the animal is in the water, although I have, whilst fishing, been so very close to them, as to throw the cork of my fishing line on their heads, to tease them. In those that I have killed, and, I assure you, I have killed a great many, if opened, to see the contents of the stomach, or take fresh fish out of them, I regularly, have found round masses of hard substance, resembling petrified wood. These masses appeared to be useful to the animal in the process of digestion, like those found in the craws of some species of birds. I have broken some of them with a hammer, and found them brittle, and as hard as stones, which they resemble, outwardly, also very much. And, as neither our lakes nor rivers, in the portion of the country I have hunted them in, afford even a pebble as large as a common egg, I have not been able to conceive how they are procured by the animals, if positively stones, or by what power wood can become stone in their stomachs.

RECREATION

When brain and body seem so jaded
That all the joy of life has faded,
Why not hie to Louisiana's sunny shore,
And try the many joys she has in store
For those to whom life seems weary,
And the future drab and dreary.
Where her denizens of wood and stream
Are waiting to make each sportsman's dream
A reality of vast delight.
Where the tarpon waits to fight,
And the wild fowl to test your skill
If you would make a kill.
And the wary white tail deer
Leaps away in fear,
As down the wind there comes the sound
Of the hunter's trailing hound,
So why not take a real vacation
And start the work of Re-creation.

—*E. B. Cope.*

FERTILIZING SHADE TREES

By HOMER L. JACOBS

Reprinted by Courtesy of "American Forests."

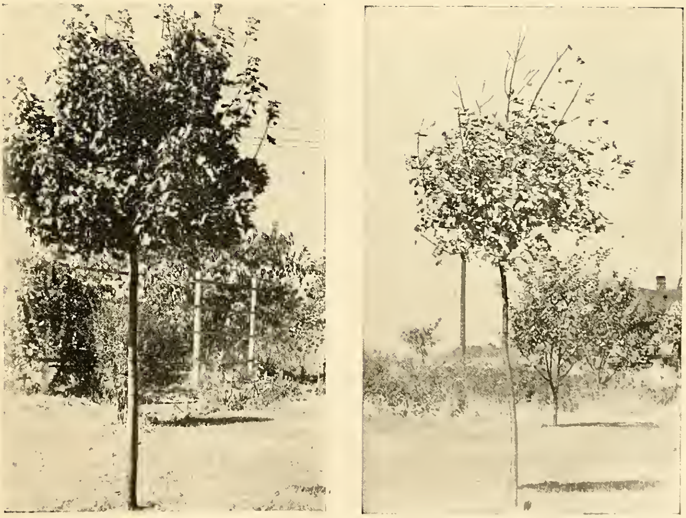
STRANGE it is, that not only indifference, but sometimes actual hostility, is found to the feeding of shade trees. The home owner carefully prepares the best and richest soil, for the annual flower bed, but assumes that the tree, which has to grow for a hundred years in one place, needs no aid in its long struggle for existence. Theoretical objections are often brought up by the professional or research horticulturist in other lines, who has but little actual experience with the feeding of trees. And many and varied are these imaginary reasons why shade trees should be set apart from all the other plants, so far as fertilizers are concerned.

The value of the application of fertilizers, both chemical and organic, to farm crops, is witnessed by the use made of them by successful farmers everywhere in the older agricultural regions in the East. Even in the newer regions of the West, which have been farmed less than fifty years, evidence is being secured to show the value of fertilizers on standard farm, and garden crops. Growers of tree crops, such as apples, peaches, and pecan nuts, generally find a favorable response to the application of chemical fertilizers.

It should be kept in mind, that the response of farm crops to fertilizers is often secured on good, well-managed soils, and on soils especially selected for the crops grown on them. Shade trees are plants, not differing greatly in fundamental requirements from other farm, garden, and orchard plants. The location of estates, homes, and streets, is not confined to good farm lands, and as a result ornamental trees are required to grow on otherwise worthless, impoverished land, and in locations where even the barest rudiments of good soil management can not be practiced. Leaving aside theories and opinions, resulting from limited observation and experience, it can be definitely stated that the general value of fertilizers in shade-tree care has been amply demonstrated, on many thousands of trees. This statement is based on many years of research, practical field experience, and observations.

It is true, the methods and materials used in agricultural operations are not always necessary nor desirable in the feeding of shade trees. This is due to the different environment in which the tree grows, and to the fact that it is not required of the tree to produce a crop of edible seeds, roots, or tubers. The form and shape of one tree may enable it to fit into a certain architectural scheme better than its neighbor would. However, the average owner values a tree because it supplies a restful color and refreshing shade during the hot and trying days of summer. And just as the good lawn must form a perfect carpet of green, so is the beautiful tree one which presents to the eye a mass of luxuriant green foliage.

While drainage and the physical condition of the soil, are of great fundamental importance in the health of a tree, chemical fertilizers play a very definite and important part in producing this healthy green foliage. As all horticulturists and soil students know, three of the eleven or more chemical elements necessary for plant life, are present in the soil in such small quantities that they often become the limiting factors in the



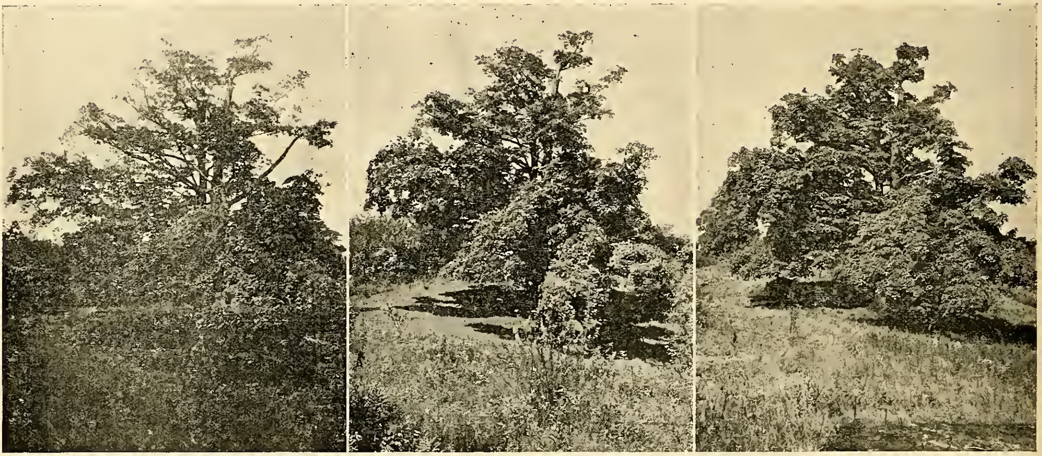
Graphic exemplification of the value of fertilization. The tree at the left is fed each year in the fall, while the tree at the right receives no feeding at all.

growth of plants. These three are, nitrogen, phosphorus, and potassium. When used in fertilizer analyses, these are stated as nitrogen, phosphoric acid, and potash. So-called complete fertilizers contain these in varying proportions. In the language of fertilizer men, a 5-10-5 means a fertilizer containing five per cent of nitrogen, ten per cent of phosphoric acid, and five per cent of potash.

While the last word in fertilizer ratios has not been written, for any crop, many fairly definite recommendations are made for certain crops. For example, a compartively high potash fertilizer is recommended for potatoes. For wheat, and many other farm and garden crops, phosphoric acid should be present in much larger quantities than either nitrogen or potash. These recommendations are based on the response made by these crops in field experiments, where varying ratios of the three elements were tried out. Thus it is clear that a complete fertilizer may be a "balanced ration" for one crop, but not for another. When trees are considered, it is found that they, too, respond to the application of one of these three elements, more readily than they do to the others. In this case it is nitrogen. In fact, the application of phosphoric acid and potash to trees has been of benefit so seldom that their presence in complete fertilizers for shade trees should be in limited quantities only, and to take care of the unusual case, when they may possibly be of value. This is true, whether the results are based on color, or other condition of the foliage, or the rapidity of trunk, and twig growth.

This lack of response to phosphorus, and potash, may be due to a number of factors. Among these may be mentioned the chemical make-up of the tree tissues, compared with the tissues of other crops; the fact that trees are able to absorb minerals over a longer period of time than annual crops, or the somewhat deeper rooting habit, which may enable them to feed in the lower mineral-containing layers of soil, which hold but little nitrogen, and which are denied to the shorter-lived plants. It is known, however, that some of the native forest soils, which have produced and are producing excellent stands of timber, are low in available phosphorus when these soils are judged by their need for phosphorous for other crops. Many species of shade trees have been shown to respond readily to the application of nitrogen only, while they were growing in soils containing negligible quantities of phosphorus from a general agricultural viewpoint.

From these facts, it can be readily seen that many of the commonly used general fertilizers, applied in the quantities recommended for gardens and lawns, do not supply shade trees with enough nitrogen. If applied in larger quantities, they may be actually wasteful, because of the large amount of unnecessary phosphorous applied. The use of a 4-12-4 ratio, for example, while beneficial in proportion to its nitrogen content, is certainly not an economical fertilizer for shade trees. A well-balanced mixture for shade trees should contain at least two, and preferably three, times as much nitrogen as phosphoric acid, or potash.

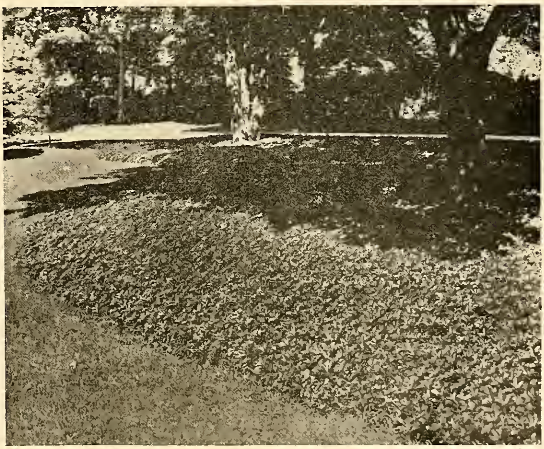

New life through proper fertilization—in August, 1927, the declining condition of this sugar maple was first observed. It was treated and fertilized and the second picture made in August, 1929, when its improvement was notable. Following this, a third exposure was made in August, 1930, which needs no enlargment, for it tells its own story of improved growth and beauty.

Not only should tree fertilizers contain large proportions of nitrogen, but some attention should be given to the materials used to supply it. It is generally considered that plants can use nitrogen most effiiciently in what is known chemically as the nitrate form. And yet nitrate nitrogen, under certain soil and moisture conditions, is readily lost to the tree. For this reason one cannot expect to supply trees entirely with nitrate nitrogen. Other and more slowly available forms must be used as well. These other forms of nitrogen are changed over to nitrate, or available nitrogen, by the action of bacteria. The activity of these bacteria in turn is influenced by several factors, one of the chief of which is temperature. In cold soils these bacteria are not at work, and in extremely dry soils their beneficial action may be checked, because the surface roots cannot absorb the nitrates. Thus, even with a fertilizer made up of both immediately available inorganic and the more slowly available organic materials, certain conditions may combine to check the supply of nitrogen from the soil to the tree. This fluctuation in the nitrogen supply can often be followed by watching the changes in color of the leaves of trees, growing in soils of limited fertility, during prolonged and extremely wet, or extremely hot and dry spells in mid-summer.

It appears, however, that trees are able to take up and store nitrogen beyond their immediate needs. Experiments have shown that well-fertilized trees maintain their rich, dark green color evenly throughout periods of adversity, when the foliage of similar trees, with a limited food supply, lose color and beauty. Fertilized trees reach their normal color earlier in the spring than unfertilized ones, and stay green, and hold their leaves longer in the fall. It is easy to have beautiful trees in June, when nature's display is at its best, but the acid test is the condition of your trees in September, after a blistering summer season, such as we had in 1930.

The feeding of trees is not a general panacea for all insects, diseases, or other troubles to which trees are heirs. Neither will an occasional halfway attempt at feeding make a thing of beauty out of a long-neglected tree. However, when a complete and careful diagnosis of a declining tree discloses no parasite responsible for the condition, thorough annual feeding usually results in an improvement that is definite, and in some cases remarkable. The photographs illustrating this tell the story. One shows a large old sugar maple, after broken and dying branches were removed and the top shaped up, in August, 1927. The foliage in the top was extremely thin, the leaves were badly scorched, and the living tissues remaining in the leaves were pale green in color. At this time the tree was given a thorough fertilization, using liberal quantities of both shredded manure and a high-nitrogen, complete fertilizer. The foliage improved in 1928, both in color and in lessened leaf scorch, but was again fertilized thoroughly, using only the complete chemical fertilizer. The second picture shows this tree in August, 1929, at which time it was given its third consecutive annual application of chemical fertilizer. The foliage, at the time the picture was taken, had thickened up appreciably, the color was a dark green, and the leaves were free from scorch. This was at the beginning of the period of scanty rainfall, which continued throughout the fall, and through the spring, and summer following, and was still in force at the time the third picture was made, in August, 1930. Note the remarkable improvement in this tree which took place without the aid of artificial watering in the driest season on record in Ohio. All through the parching, rainless days of August and September, this tree held up to the sky great masses of refreshing, unscorched foliage, in a manner to gladden the heart of the tree lover.

This does not mean that trees do not need aid in the form of watering in times of drought. But feeding, as the records of this sugar maple and other trees show, is a very definite aid in helping



—*Hugh P. Barcley.*

Pachysandra offers one of the most beautiful of the permanent ground covers for planting beneath shade trees.

trees to resist the effects of drought. The effect of an enriched soil on moisture relations of plants, has been fully demonstrated by studies of soils and field crops. It has been shown that the addition of fertilizers enabled a poor soil to produce a pound of corn with thirty-six per cent less water than was transpired in a similar unfertilized poor soil, in producing a pound of corn under the same weather conditions. A striking example of this decreased water requirement, due to fertilizer, has been reported recently, from the New York Geneva Experiment Station. Lysimeter tanks were installed in such a way that an accurate record could be kept of all drainage water from a given depth of soil. Two series of tanks grew the same crops, and received the same rainfall. One series received additional nitrogen, in the form of fertilizers, while the other did not. The tanks receiving nitrogen produced a larger crop of dry matter, and yet actually delivered to the drainage pipes twelve per cent more unused water than the tanks which received no nitrogen. When these facts are considered, it is clear why trees growing in a soil solution enriched by years of feeding may be able to grow steadily on in the face of drought.

Still another benefit in relation to drought resistance, is the effect of feeding on root growth. Recent experiments by several soil workers seem to indicate that one of the chief benefits of cultivation is not the conservation of moisture due to the stirring of the soil itself. Instead, it is believed that this conservation of moisture is due to the fact that cultivation kills weeds, and so reduces the demands made on the soil. In most cases, shade trees are growing in locations where the lawns must be preserved, and so the benefit of cultivation resulting from reducing competition for moisture, is denied the shade tree. On the other hand, it may be that cultivation and the surface application of fertilizers are not only impractical, but actually undesirable for many species of shade trees.

It has been shown that on many species any soil improvement by means of better air conditions, humus or mineral supply, results in an increased growth of roots in the improved soil area. Where trees have to compete with grass roots for food and moisture, and where the surface soil is exposed to severe and rapid changes in temperature, both winter and summer, it may not be desirable to encourage surface rooting by improving only the top few inches of soil. Apparently, only one thing definitely limits the downward growth of roots. That is the presence of a permanent water table or completely water-saturated soil. This, of course, means a lack of air, which then becomes the chief limiting factor. Around most homes the subsoil has been cut into for the basement drain, storm sewers, and other pipe lines, so that free water is not usually found short of several feet in depth.

Thus vigorous root growth is not necessarily limited to the surface foot or two of soil, if only more abundant air, nitrogen, and humus, can be introduced into this store of mineral, and moisture-laden subsoil. With a somewhat larger portion of the active feeding roots growing in the lower improved soil levels, the tree then becomes more independent of surface moisture and severe changes in temperature.

The perforation method, developed by tree experts for the feeding of trees, tends to bring about this enrichment of the soil well below the surface level, and so has much to recommend it, from both a practical and scientific viewpoint. Repeated observations have shown active, vigorous feeding roots, growing into the materials placed in these holes, at depths ranging from twelve to twenty-four inches, or even deeper. Repeated feeding by this process, from year to year, making numerous holes each time, and using both inorganic and organic materials, cannot fail to have a beneficial effect on the spread, depth, and vigor of the root system.

Many trees, however, have a decidedly shallow or surface root system, even where conditions are such that deeper rooting would seem likely to take place. And such trees as the American beech, and Norway spruce, for example, are especially sensitive to changes which affect the surface soil. This is shown by the rapid decline of native beeches, when their environment is changed, by bringing them under lawn conditions. In such cases the lower branches of the tree, or the protecting underbrush, and the surface litter, are removed. As a result, the surface roots are exposed to the action of the hot and drying sun in summer, and the extremes of temperature in winter.

For such trees, in addition to the judicious use of chemical fertilizers and water, the use of ground-cover plantings may be considered. Many species of plants have the ability to endure dense shade. Some of these thrive in both shade or partial sunshine, and yet grow in such a manner that they form a dense shade of their own to the surface of the soil. When they combine that with an open type of growth, which allows ready access of air and moisture to the roots, an ideal type of cover is formed for shallow-rooted trees. The use of such plants as *Pachysandra terminalis* or

(*Continued on page 29*)

FISHERIES PROGRESS

By LEWIS RADCLIFFE
Deputy Commissioner of Fisheries

Address delivered at the Southern Fisheries Association Convention, Jacksonville, Fla., July, 1931.

YOU are representatives of a great industry, producing 3½ billion pounds of products annually, returning to the fishermen of our country $123,000,00. Production in the South Atlantice and Gulf States in 1929 totaled 535 million pounds, valued at $14,900,000. Among your leading fisheries were: Shrimp, 108,551,000 pounds, value $4,435,000; market oysters, 5,897,000 bushels, value $1,672,000; mullet, 33,661,000 pounds, value 1,328,000; trout, 11,330,000 pounds, value $875,000; and snappers, 10,326,000 pounds, value $831,000. In 1930 you produced canned fishery products to the value of $6,943,000, and by-products valued at $3,106,000. Shrimp was the most important canned product, 818,616 standard cases, valued at nearly $4,962,000; and oyster shell products, the most important by-product, totaled 221,192 tons, valued at $1,716,874. By your presence you have demonstrated your faith in the value of your trade association.

On a recent occasion, the Assistant Secretary of Commerce, Dr. Klein, evaluated the trade association in these words—"Among the greatest, if not the greatest contribution to good will, higher morals, and national betterment among industries, and consumers alike, is the get-together spirit of American business men, evinced through their trade associations.

"I hear some trade association members talking these days about resigning from their organizations, with the object mainly of saving money. I can think of nothing more dangerously extravagant than that—a wasteful squandering of that invaluable asset of good teamwork, at the very time when collaboration is absolutely vital."

I recall no period since the last great War, when members of the fishing industry have so closely studied the publications of the Bureau of Fisheries, and made much general use of the information contained therein. Conventions such as this afford an opportunity to review recent advances, and I am pleased to avail myself of the opportunity to call your attention to some of these.

Recent progress in the study of nutrition has stimulated a widespread interest in the source of vitamins. Fortunately for the fishing industry, sea foods are a rich source of supply of vitamins A and D. Cod-liver oil has long been recognized as having valuable pharmaceutical properties, and more recently it has been shown that its value is largely dependent on its richness in the vitamins. Experiments initiated 1½ years ago, by the Bureau of Fisheries, in cooperation with the Department of Agriculture, have disclosed the richness of domestic fish oils in these vitamins. This has been of great importance t o our domestic fish oil industry, as about 90 per cent of our cod-liver consumption is important. The introduction of domestic fish oils into animal feeding has created a new market, at a time when the domestic market was greatly depressed, thus providing outlets for stocks on hand, at reasonable prices. It has also benefited our farmers, through making available to them these feeding oils at much lower prices than that customarily paid for cod-liver oil. It is possible to manufacture menhaden oil, with a high feeding value. Your producers may well give consideration to changes in their processes necessary for the production of better feeding oils, and meals.

A new fishery product, which is attracting a surprising amount of attention, is fish flour. At present this is made only from the edible parts of non-oily fishes, at low temperature, under vacuum, and ground into a fine flour. It has a pleasant taste, odor, and fluffy appearance. In cooking, it may easily be disguised to prevent detection of any fishy taste, and may be used in such bakery products as cinnamon, and ginger cookies, salt crackers, and in fish chowders, and other similar dishes. It may contain up to 30 per cent of minerals, mostly calcium phosphate, as well as appreciable amounts of iodine, and smaller amounts of copper, and other minerals. Its protein content ranges from 55 to 80 per cent, and fat content from 1½ to 2½ per cent, or more. Properly manufactured, it should have a high nutritive value, especially for its mineral content, and should prove to be a valuable supplement to certain food products, especially for growing children. I would suggest that you give careful consideration to the practicability of utilizing some of your Southern fish, such as the grouper, in the manufacture of this new product.

Oystering represent one of your most important industries. Over-exploitation, without proper encouragement to oyster farming, has resulted in a declining yeild. Many areas are unproductive. Under proper administration, oyster farming may be made one of the most valuable crops in the South. Desirous of rendering the South all possible aid in this field, the Bureau of Fisheries has detailed one of its skilled oyster experts, Dr. H. F. Prytherch, to the Directorship of the Beaufort, N. C., biological station. Dr. Prytherch has conferred with State officials, and representative men in the industry, in an effort to formulate a constructive program, which he will explain.

The southern fishery for shrimp has steadily increased to over 100 million pounds, representing one-fifth of your total fishery harvest. The destruction of this fishery would, therefore, represent a severe loss to the south. Acting upon the request of southern producers, and State officials, the Bureau has initiated an extensive research program from North Carolina to Texas. A staff of eight investigators are located in North Carolina, Georgia, Louisiana, and Texas, the largest scale of investigations being made in cooperation with the Louisiana State authorities. As producers, you will be particularly interested in the determinations of the actual abundance of shrimp, and I am certain you will be very much interested in Dr. Weymouth's discussion of the subject.

Some of your Southern fish companies have revealed a commendable effort to keep abreast of the times in the freezing of shrimp, and their distribution by insulated refrigerator trucks. The companies are enabled to render their customers better service, with less loss, in transportation and accounts. The service revealed that the patrons of the companies—clubs, hotels, cafes, roadhouses, and local distributors —were pleased and a decided preference shown for the frozen, rather than the fresh shrimp. The developments should be followed closely, and may point the way to a solution of some difficulties which you now face.

Last summer, one of the Bureau's ichthyologists spent nearly 10 weeks along the Gulf Coast, collecting material for a report on the fishes of the Gulf. Five 16-gallon tanks of specimens of the less common species, and those about which there was uncertainty, were collected, and shipped to Washington for further study. In due time a report will be issued, which I am certain will represent a most valuable contribution to the fish fauna of the Gulf of Mexico, and will prove very helpful to all who are interested in the fisheries.

The five-year construction and maintenance program of the Bureau, authorizes the enlargement of the Orangeburg (S. C.) fish-cultural station, and new stations in Tennessee, Florida, Alabama, Louisiana, Texas, and New Mexico, and a laboratory in Texas. By the time this program is completed, we shall be in a much better position to fill the need of Southern anglers.

The Bureau of Fisheries is now making annually, a canvass of the fisheries of the South Atlantic, and Gulf States. The published bulletins make available to you means for studying the trend of the fisheries, per unit values, the importance of each region in production, the need for regulation, and are useful in tariff and rate hearings; as a basis for harbor improvements, and other useful purposes. I am informed, that at a recent rate hearing, our statistics were invaluable to the industry in the presentation of its case. We also make an annual canvass of the canned and cured fishery products, and by-products industries. These should prove useful to you in following developments and conditions in these important industries. In the case of the canned oyster industry, we not only canvass it by calendar year, but by the seasonal year, and also a survey on the quantities of unsold stocks of canned oysters in the hands of packers, on May 1st and October 1st of each year. Information on past demand, supply, and prices of commodity, with some indication as to probable future demand and supply, future cost, and prices, is a type of service much needed by industry, to enable it to operate most successfully.

The activities of the Bureau are quite varied. Last year, at the request of the Hawaiian government, the Bureau detailed its oyster expert to take an expedition to a section of the Archipelago, 1200 miles to the westward of Honolulu, to make a survey of the pearl oyster resources of Pearl and Hermes reef, with recommendations for the conservation of this highly valued shellfish. A stock of adult oysters were brought back to Honolulu, and planted in suitable nearby waters. In April these were reported to be doing well, those examined revealing remarkable growth.

The Bureau recently detailed two of its employees to the Virgin Islands, to study the fisheries situation, and make recommendations relative to their development, to more adequately serve the inhabitants' needs and relieve distress. One of the men is now studying conditions in Porto Rico, in cooperation with the Island government. It is to be hoped that these studies will afford means for improving living conditions.

In conclusion, I wish to express appreciation to your State officers for the cordial cooperation they are giving us in our scientific work. In October, 1930, Mr. Twitty called an important seafood conference in Savannah, Ga., for special consideration of the extension of the oyster industry, and other fishery matters. The State of Louisiana has established a division of statistical and biological research, and is cooperating on a considerable scale in our shrimp investigations. In my opinion each of your Southern states should have at least one biologist on its staff for a study of important fishery problems.

LOUISIANA SHRIMP

Wholesome, Nourishing, and Economical Food---Iodine Content Counteracts Goitre and Rickets---Appetizing Recipes Suggested.

LOUISIANA sea shrimp, sometimes called lake shrimp, is a most delicious seafood. Appreciating that a knowledge of how to use this seafood to the greatest advantage would be of benefit to the readers of the Louisiana Conservation Review, the editor has obtained from one of the large shrimp canners a number of recipes for the use of canned shrimp, which recipes we recommend should be turned over to the wives of our readers so that they may enjoy the delicacy of this seafood in the various ways there presented.

The recipes which we have obtained are as folloms:*

CANAPE OF SHRIMP

Spread anchovy butter on toast cut into fancy shapes. Mince shrimp, red and green peppers, and some apple, very fine; mix with a little mayonnaise; spread on thin slices of tomatoes, lay on toast, decorate with chopped eggs, bits of shrimp, and peppers.

SHRIMP COCKTAIL

Mix together the strained juice of ½ a lemon, ½-teaspoonful of vinegar, 8 drops of tabasco sauce, ½-teaspoonful horseradish, and ½-teaspoonful tomato catsup. Add 1 can shrimp. Serve in thoroughly chilled glasses.

SHRIMP SOUP

Cut up 2 small onions, 2 small carrots, a piece of celery, and cook in butter, adding 1 pint fish stock and parsley, thyme, bay leaves and cloves. Season with salt, pepper, and a small pinch of cayenne; cook for a quarter of an hour. Brown tablespoonful flour in ¼-lb. of butter in a saucepan. Add ¼-gallon beef stock and stir until it begins to boil. Add ½-can of shrimp, mashed fine, and cook for five minutes more. Strain and add 2 oz. cooked rice; pour into soup tureen, add the other half of the can of shrimp, whole and serve.

BISQUE OF SHRIMP

Cook 3 oz. rice in 1½ pints milk until soft and mushy. Rub it through a cheesecloth or fine sieve. Let 1 large can shrimp simmer in 1½ oz. butter; add 1 pint water and the strained rice and milk; boil ten minutes. Add ½-pint cream; salt, nutmeg and cayenne pepper to taste; add 1½ oz. more butter, and a half cup of cooked whole rice. Serve with croutons.

CREOLE GUMBO

Cut a chicken in pieces and fry in hot lard. Add an onion, sliced, 1 spoonful flour, 2 dozen oysters, and several pieces of ham, and fry till brown. Add 1½ quarts water and boil for an hour. Season with chopped parsley, salt and strong pepper. Add 1 large can shrimp and cook for fifteen minutes longer; then pour at once into a tureen, and add boiled rice.

CHICKEN AND SHRIMP GUMBO

Boil 1 chicken in 1½ gallons water, till reduced to ½. Fry it in 1 tablespoonful lard, with 1 onion, 1 slice ham and 1 can of okra. Add 8 tomatoes and the water that the chicken was boiled in. Boil about 2 hours, then add 1 large can shrimp and cook about fifteen minutes longer. Serve with boiled rice. Season with garlic, pepper, 2 teaspoonfuls salt, 2 bay leaves and a sprig of thyme.

Heat ½-pint of thick cream with 1 cup milk; add 4 tablespoonfuls of tomato soup; pepper and salt to taste, then add 2 cans shrimp, and 1 can of peas. Heat thoroughly and serve on crisp crackers or toast.

CREAMED SHRIMP

Heat half a pint of thick cream with 1 cup milk; add 4 tablespoonfuls of tomato soup; pepper and salt to taste, then add 2 cans shrimp, and 1 can of peas. Heat thoroughly and serve on crisp crackers or toast.

FRICASSEE OF SHRIMP, POULETTE STYLE

To one large can of shrimp add a sauce made as follows: ¼-cup butter, ¼-cup flour, ½-teaspoonful salt, and 1½ cups white stock; add one minced shallot, sliced mushrooms, a pinch of pepper, and a tablespoonful of anchovy essence. Heat without boiling, add the beaten yolks of two eggs and ½-cup cream, and finally a teaspoonful of lemon juice. Serve hot at the table on thin crisp slices of toast.

STEWED SHRIMP

Chop ½ a small onion fine and brown it in a half a teaspoonful of butter. Add 3 large juicy tomatoes, chopped fine, with their juice; stir well and brown slightly. Add a stalk of celery, thyme, a bay leaf, a dash of cayenne, and salt and garlic to taste, all chopped fine. Cook 10 minutes and add 1 large can shrimp, cook 10 minutes more and serve. Do not add any water.

SHRIMP BUSH

Pack the shrimp into a small, deep dish or tumbler, and press them down hard; when turned over they will cling together in a solid mass. Take dainty bits of celery tips and asparagus tips, or fried parsley for the decorations, and serve with quartered lemons, as a hors d'oeuvre.

STUFFED CUCUMBERS WITH SHRIMP

Boil 6 cucumbers with salt until half cooked. Scoop out the centers and mix them with 1 can of shrimp, 2 tablespoonfuls tomato, ½-cup mushrooms, 1 cup fresh bread crumbs, 1 tablespoonful butter, 1 teaspoonful salt, ½-teaspoonful minced parsley, and ¼-teaspoonful minced onion; chop fine and fry in butter. Fill the cucumbers with this, sprinkle with bread crumbs, and put a piece of butter on each. Bake about ten minutes.

ESCALLOPED SHRIMP

Place in a baking dish a layer of shrimp; spread bread crumbs over them, sprinkle with salt and pepper and bits of butter. Repeat this operation until the dish is nearly full, with crumbs on top. Pour over them a sauce made of 1 cup milk, a tablespoonful of butter, and a tablespoonful of flour. Bake about fifteen minutes in a hot oven.

STUFFED TOMATOES AND SHRIMP

Cut off the tops of 8 large tomatoes and scoop out the centers, mix the centers with ½-teaspoonful chopped onion, 3 slices of bread, ½-teaspoonful minced parsley, ½-teaspoonful salt, ½-pod minced pepper and 1 can of shrimp. Fry in 1 tablespoonful butter until cooked, then put back in tomatoes. Sprinkle with bread crumbs, put a piece of butter on each, and bake 15 minutes.

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*Submitted by Southern Canners Exchange.

SHRIMP, CORN AND TOMATO STEW

Grate 1 dozen ears corn, peel 2 dozen tomatoes, fry them in ½-cup butter, and add 1 tablespoonful Worcestershire sauce, and salt and pepper as desired. Stew for half an hour, add 1 large can shrimp and cook 15 minutes longer.

SHRIMP AU GRATIN

Boil 1 pint stock, 1½ tablespoonfuls browned flour, ½-cup butter, 1 tablespoonful Worcestershire, and minced parsley, salt and pepper, for five minutes. Add 1 large can of shrimp, and cook about five minutes longer. Put in baking dish, sprinkle with bread crumbs, and bake about ten minutes.

FRIED SHRIMP

Season ½-cup milk with salt, cayenne, and nutmeg; pour over 1 large can of shrimp, turn them a few times, pour off the milk, and add 1 beaten egg. Sprinkle a little flour over the shrimp, then dip them one at a time in the egg and milk, then in bread crumbs, cracker meal, or corn meal. Fry in hot lard. Serve with lemon and fried parsley, fried diced potatoes or Saratoga chips.

SHRIMP A LA BANG

Arrange in baking dish a layer of shrimp, sprinkle with salt, pepper and chives, add a thin layer of bread crumbs and cover generously with butter. Add another layer of shrimp, etc., until dish is filled. Bake in a moderately hot oven for twenty minutes, and serve with plenty of melted butter sauce. A quart of shrimp, 3 heaping teaspoonfuls chives, 2 scant cups crumbs, and ½-lb. butter will be needed.

STUFFED EGGPLANTS WITH SHRIMP

Boil two eggplants and scoop out the centers. Mix the centers with 4 slices bread, ½-teaspoonful minced onion, 2 tablespoonfuls tomato, and 1 can of shrimp, chop all together. Boil ½-cup milk, ½-teaspoonful salt, ½-pod chopped pepper, and 1½ tablespoonfuls butter, and while hot, pour this over the shrimp, etc. Bake for half an hour.

STUFFED PEPPERS AND SHRIMP

Cut off the tops of the peppers. Heat 1 tablespoonful butter, add ¼-teaspoonful minced onion and the tops of the peppers, chopped, and let them simmer until tender. Add ½-cup mushrooms and let simmer, then add 2 tablespoonfuls tomato, chopped, 1 teaspoonful salt, ½-teaspoonful minced parsley, and 1 can of shrimp. When all is heated together, sprinkle in the bread crumbs, fill the peppers, put a piece of butter on each, and bake about ten minutes.

STEWED SHRIMP

Brown ½ tablespoonful flour, mix with 1 tablespoonful hot butter, 1 tablespoonful tomato, ¼-tablespoonful each of thyme and minced parsley, and 1 bay leaf. Cook about 15 minutes; add 1 large can of shrimp and cook about 15 minutes longer.

SHRIMP EN BROCHETTE

Cut as many squares of bacon and fresh mushrooms as will be needed. Fasten shrimp, bacon and mushroom alternately on skewer; brush with melted butter or oil; broil brown all around. Lay the skewer on a strip of toast, sprinkle with chopped parsley and butter, and garnish with lemon slices and parsley sprigs.

SHRIMP TAMALES

Chop 1 can of shrimp very fine with 1 tablespoonful suet, 1 tablespoonful chili powder, and 1 teaspoonful salt; then fry, and add 1 tablespoonful warm water. Make a dough of 1 quart of corn meal, 2 tablespoonfuls lard, 1 cup stock, and 1 teaspoonful salt. Boil about 2 dozen pieces of corn husks and mop each one with melted lard; spread the meal dough on them, then the shrimp; roll and twist the ends, and steam 2 hours. Serve hot.

SHRIMP OMELETTE

Beat up 7 eggs with ½-tablespoonful cream and ¼-teaspoon minced parsley. Season with salt and pepper. Add 1 small can of shrimp, minced or whole, as desired. Cook in a hot buttered skillet a few minutes. Turn the omelette and serve on a hot plate.

EGGS STUFFED WITH SHRIMP, PICAYUNE STYLE

Mince some shrimp, some green and red peppers, some green corn, and a very little onion. Let simmer in a little butter; add salt to taste, and enough chili sauce to moisten it, and a few bread crumbs. Fill halves of hard boiled eggs, with the yolks removed, heaping full and cover with tops; heat in the oven, place on buttered rice, pour a thick cream sauce over the eggs, and sprinkle the chopped yolks over all.

BAKED SHRIMP

Butter a dish well and put in it a layer of grated bread crumbs or powered cracker. Stew 3 tomatoes in ¼-tablespoonful butter, and sprinkle with pepper and salt. Place a layer of tomatoes in the dish and spread bread crumbs over them. Wash 1 can of shrimp, and season well; put a layer of shrimp in the dish. Repeat layers of tomatoes, crumbs and shrimp; spread crumbs and small dabs of butter on top; bake till well browned.

VOL-AU-VENT OF SHRIMP

Break off the crust of a slice of stale bread, grate it fine, season the rest of the bread highly with salt, pepper, ground nutmeg, chopped mace, thyme and parsley, and a dash of cayenne. Mix with 1 large can of shrimp, and bake; sprinkle it with the grated bread and dot with butter. Make a sauce as follows; put ¼-tablespoonful of butter into a asucepan, add ¼-pint of shrimp, a large tomato chopped fine, and celery, thyme, a bay leaf, and parsley, all chopped fine and mixed. Cook this for three or four minutes, and add ⅛-pint of oyster stock. Pour this sauce over the pie.

SHRIMP PIE

Pour into a saucepan 2 tablespoonfuls tomatoes, 1 tablespoonful browned flour, ½-teaspoonful minced parsley, 1 teaspoonful minced onion, 1 teaspoonful salt, a dash of cayenne pepper and 1½ cups of stock. Cook for five minutes and strain. Add 2 cans chopped shrimp, 2 tablespoonfuls buttter, and 1 tablespoonful Worcestershire sauce. Serve in cooked pastry.

EGGS AND SHRIMP BENEDICTINE

Mash the shrimp fine, season with salt, white pepper, and mace, and moisten with cream sauce. Shape into thin round cakes, place one poached egg on each and pour on a rich cream sauce. Garnish with slices of truffles; trace meat glace over it in thin lines.

SHRIMP COQUILLE

Thicken ¼-pint milk with 1 tablespoonful butter and ¼-teaspoonful flour; boil with ½-teaspoonful minced onion and ¼-teaspoonful minced parsley. Add 1 large can shrimp, ½-teaspoonful salt, ½-pod pepper, and ½-tablespoonful Worcestershire sauce, and boil about five minutes longer. Put in baking dish and bake about five minutes, after covering with bread crumbs and bits of butter.

SHRIMP IN BLANKETS

Soak shrimp in milk, with seasoning, wrap them in thin slices of bacon or fat pork; lay in double boiler and broil brown on both sides. Serve on toasted wafers, with quartered lemons.

SHRIMP PATTIES

Mince fine 1 can of shrimp, season with pepper and salt, some minced parsley and onion. Moisten with cream sauce, line shells with parsley, and fill. Put a piece of butter on each patty and brown.

SHRIMP AND SPAGHETTI

Put 1 lb. spaghetti in a pan of boiling water containing salt; boil until cooked, but not soft, which will take about half an hour. Fry 1 large can of shrimp in hot lard with 1 finely chopped onion; season lightly with salt and pepper. Spread the shrimp over the spaghetti, and decorate with long strings of spaghetti wound around.

FRICASSEE OF SHRIMP

Stew 1 quart of tomatoes with a quart of water, adding onions to suit taste. When the tomatoes will go through a sieve, strain, season highly, add a tablespoonful of butter creamed with a little flour, and stew for fifteen minutes more. Wash 2 cans of shrimp and add. Heat thoroughly; serve with 2 spoonfuls of rice on each plate.

FISH AU GRATIN WITH SHRIMP

Bake fish in platter for about an hour with 1 large can of shrimp, ½-pint tomatoes, 1 pint mushrooms, 2 tablespoonfuls Worcestershire, 1 cup browned bread crumbs, ¾-cup butter, 1 cup stock, ½-teaspoonful minced parsley, 2 teaspoonfuls salt, and tobasco sauce to taste.

SHRIMP A LA NEWBURG

Simmer 1 large can of shrimp in 2 oz. butter. Add 1 cup cream, boil a few minutes, beat the yolks of 2 eggs and stir or shake this into the shrimp until it begins to thicken, but do not boil. Garnish with chopped or sliced truffles. Add salt, nutmeg, and cayenne pepper to taste.

SHRIMP BALLS

Chop fine, 1 can of shrimp. Add ½-cup fresh bread crumbs, ½-cup tomatoes, ½-teaspoonful salt, ¼-teaspoonful pepper, and an egg. Roll into balls and dry in 1 tablespoonful butter. Add ½-teaspoonful browned flour, and 5 or 6 tomatoes, ¼-teaspoonful minced onion, and ¼-teaspoonful minced parsley; cook for about hanf an hour.

SHRIMP CROQUETTES

Chop 2 cans of shrimp, 2 tablespoonfuls boiled rice, 1 tablespoonful tomato, 2 hard boiled eggs, 2 tablespoonfuls butter, 1 tablespoonful salt, and a pinch of cayenne pepper. Add ½-cup cream or milk; mould into croquettes; dip into bread crumbs, then in whipped eggs (2), then in bread crumbs again. Fry in hot lard.

SHRIMP SANDWICHES

Pound 1 large can of shrimp in a mortar, or grind very fine through meat cutter. Add 4 oz. butter and mix thoroughly. Add slowly ½-cup cream; season highly with salt, paprika, a little mustard, and Worcestershire sauce. Cut very thin slices of fresh graham bread, spread one side with mixture and roll like jelly rolls. Make white sandwiches in the usual manner and cut into finger strips.

JELLIED SHRIMP SALAD

Pour ½-envelope gelatine into ½-cup cold water; let it soak for five minutes; dissolve it in 1½ cups hot broth (clam, chicken, fish or vegetable) and let it cool. Stand a mold in ice water; chop 2 truffles; pour 1 large can of shrimp, truffles, 1 tablespoonful lemon juice, ½-pint cooked peas and 1 tablespoonful capers into the broth, and with this fill the mold. Garnish with lettuce, quartered lemon, and slices of hard boiled eggs.

SHRIMP IN TOMATO CATSUP

Season 1 can of shrimp well with black pepper, salt, and a dash of cayenne. Add tomato catsup, and garnish with lettuce leaves and hard boiled eggs.

SHRIMP JAMBALAYA

Wash 1 cupful rice in cold water. Fry rice with 1 chopped onion, thoroughly in hod lard. Add 1 can of shrimp, stirring constantly. When brown add water, to which a cup of tomato has been added, to cover the whole, season with salt, pepper, a bay leaf, thyme, and chopped parsley. Boil slowly, adding water till the rice is well cooked. Let it fry and serve hot.

SHRIMP A LA CREOLE

Mix 2 tablespoonfuls melted butter with a tablespoonful browned flour, 2 tablespoonfuls tomato, ½-teaspoonful minced onion, 1 teaspoonful salt, 1 pod pepper, 1½ pints stock, 2 bay leaves, ½-teaspoonful thyme, and ½ teaspoonful minced parsley. Cook about twenty minutes, then add 1 large can of shrimp and cook 10 minutes longer. Serve on toast or with boiled rice.

MAYONNAISE OF CELERY AND SHRIMP

Mash the yolks of 3 hard boiled eggs thoroughly with a spoonful each of butter, oil and vinegar. Add salt and pepper to taste. Chop the white of the eggs and add this, with several pieces of celery cut into strips, and a spoonful sliced pickles. Cover the shrimp with the whole of this and serve cold.

SHRIMP SALAD

Mix 2 cans of shrimp with ½-cup minced celery, 1 teaspoonful salt, and a few drops tobasco, arrange this in layers alternately with 4 sliced tomatoes and a dozen stoned olives. Serve on lettuce with 1 cupful mayonnaise, garnish wtih hard boiled eggs, sliced.

SHRIMP SALAD IN TOMATOES

Cut out the centers of 12 tomatoes. Mix 1 can of shrimp with 1 cup mayonnaise, seasoning with cayenne pepper. Fill the tomatoes, grate a hard boiled egg over them, and serve on lettuce leaves, garnishing with olives, capers, or celery tips.

SHRIMP SALAD IN TOMATOES

Scoop out the insides of 6 or 7 large tomatoes. Mix 1 large can of shrimp with 1 cup mayonnaise, ½-cup chopped nuts, ½-bottle chopped pimento olives and several celery stalks, chopped. Fill the tomatoes with this. Serve on lettuce leaves, sprinkling over the tomatoes two hard boiled eggs, chopped fine.

SHRIMP SALAD

Season 1 can of shrimp well with salt and pepper, chop a few pieces celery well with a little onion, and add. Pour over the mayonnaise sauce, and garnish with sliced hard boiled eggs, sliced lemon, beets and celery tops.

SHRIMP AND ASPARAGUS SALAD

Wash the shrimp and asparagus and put in the refrigerator to cool, with a head of lettuce. When ready to serve, line a bowl with lettuce leaves, place shrimp in the bowl, squeezing a little lemon over them; lay the asparagus over the shrimp and cover with French dressing.

SHRIMP NUT SALAD

Mix shrimp with English walnuts and chopped apples in mayonnaise dressing. Garnish with chopped nuts and pimento strips.

SHRIMP SALAD IN ASPIC

Line a border mould with sections of hard boiled eggs, peas and shrimp, dipping these first in half-set aspic; fill the rest of the mould with jelly, vegetables, etc. Dip the mould in hot water and turn out the contents in lettuce leaves. Fill in the center space with chopped shrimp dressed with French dressing, and cover with jelly mayonnaise, decorating with shrimp, pieces of red and green peppers alternating, and a small beet cut into the shape of a rose.

The recipes given below through the courtesy of Dorgan-McPhillips Packing Corp., Mobile, Alabama.

A LA KING

Two cans shrimp, flaked; ½-cup minced green pepper; 1 tablespoon minced pimento; 1 cup milk or liquor from cans; toast; ½-cup minced celery; 1 tablespoon butter; 1 tablespoon flour; salt and pepper.

Simmer green pepper, celery and pimento in butter until tender. Add flour, then stir in milk, gradually. Season and add shrimp. Heat thoroughly and serve on toast. (In quantity cooking for church dinners, the liquid can be kept hot without danger of burning. Take amount needed for serving and add shrimp. This puts food on the table absolutely fresh.) Serves six.

AU GRATIN

Three cans shrimp; 1 cup milk; 1 cup liquor from cans; 4 tablespoons butter; 3 egg yolks, well beaten; ¼-cup grated cheese; 3 tablespoons flour; ½-teaspoon salt; ¼-teaspoon pepper.

Melt butter in saucepan, stir until bubbling, add flour mixed with pepper and salt. Gradually pour milk, mixed with shrimp liquor, over the flour mixture. Stir until smooth and creamy, adding egg yolks. Mix shrimp and sauce and place in buttered baking dish (individual au Gratin dishes if preferred) and sprinkle lightly with cheese. Place in broiler and brown. Serves six.

BAKED, SCHREIBER

Two cans shrimp, flaked; 2 eggs, well beaten; 1 pint milk; salt and pepper.

Combine milk, eggs, and seasoning, pour over shrimp in buttered baking dish. Bake in slow oven (325° F.) until firm. Serve immediately. Serves four.

CAKES OR BALLS

Two cans shrimp, flaked; salt and pepper; 4 cups boiled rice or white potatoes; 2 eggs, beaten; 1 onion, minced; 3 teaspoons cream; 1 tablespoon butter; 1 egg, 2 tablespoons cold water, crumbs; cooking fat; 1 teaspoon lemon juice.

Mix shrimp, rice, or potatoes, butter, 2 eggs, onion, lemon juice, cream and seasonings, thoroughly. Form into balls. Egg and crumb and fry in hot fat (390° F.). Serve hot. Serves eight.

CANAPE

One-half can shrimp, flaked; 1 hard cooked egg, chopped; 1 tablespoon minced celery; 2 tablespoons mayonnaise; 1 teaspoon minced onion; 1 cucumber pickle, chopped; butter; Nut bread or brown bread.

Mix shrimp with egg, celery, onion, mayonnaise and pickle. Spread on rounds of buttered bread. Serves six.

HASH

Two cans shrimp, flaked; 2 tablespoons minced green pepper; 2 eggs; 2 cups mashed potatoes; 4 tablespoons chopped onion; ½-cup shrimp liquor; 4 slices bacon, chopped; salt and pepper.

Mix shrimp, potatoes, green pepper, onions, eggs and seasonings. Fry bacon until crisp. Turn hash into pan with bacon, add shrimp liquor, heat slowly, stirring often until heated through. Spread evenly and brown. Fold and serve hot. Serves six.

OMELETTE

One can shrimp, flaked; 6 eggs; 12 tablespoons milk; salt and pepper.

Beat egg yolk until thick. Add milk and seasoning. Gently stir in whites (beaten until very stiff). Pour into greased pan and bake in hot oven until eggs are set. Place heated shrimp on omelette and fold. Serve immediately. Serves six.

CREOLE

Two cans shrimp; 2 tablespoons melted butter; 1 cup chopped onion; 1 cup chopped green pepper; ½ clove garlic, chopped; 1 pint stewed tomatoes; salt and pepper; ¼-teaspoon paprika.

Melt butter, add paprika and stir until blended. Add onion, green pepper and garlic; simmer until tender, then add tomatoes, salt and pepper. Boil 5 minutes. Place shrimp in this sauce and boil for 10 minutes. Serve hot. Serves Six.

SALAD

Two cans shrimp, minced; 1 hard cooked egg, minced; 1 tablespoon mayonnaise; 3 stalks celery, diced; 1 large tomato, diced; 2 tablespoons vinegar or lemon juice; ½-cup chopped nuts; lettuce or parsley; 1 tablespoon chopped olives.

Mix ingredients and garnish with parsley or lettuce leaves. Serve with selected dressing. Serves six.

CHOWDER

Two cans shrimp; ¼-cup diced salt pork; 1 cup diced celery; 1 quart diced cooked potatoes; ¼-teaspoon pepper; 1 tablespoon flour; paprika; 1 quart boiling water; 2 teaspoons salt; ½-teaspoon celery salt; 1 pint milk; 1 tablespoon butter; 1 large onion, chopped; 1 teaspoon minced parsley.

Fry pork in kettle in which chowder is to be made. Remove crispy bits and in the fat cook onion; when yellow add celery and boiling water. Cook 15 minutes, then add potatoes, salt, pepper and celery salt. Let all come to a boil and add shrimp. Cook 15 minutes, longer and add milk. When this again comes to a boil thicken with flour and butter cooked together. Pour into serving dishes and sprinkle with paprika and finely minced parsley. This is intended as the main dish for any meal. For the soup course, make it thinner. Serves eight.

PIE

Two cans shrimp, flaked; salt; sage; 1 cup white asuce; 2 cups mashed potatoes; 2 tablespoons minced green peppers.

Mix shrimp, green pepper, seasonings and sauce together. Place in casserole, cover with mashed potatoes. Bake in hot oven (450° F.) until pie bubbles and steams. Uncover and brown. Serve at once. Serves six.

SANDWICH FILLING

One can shrimp, flaked; 1 hard cooked egg, minced; 1 cucumber pickle, chopped; Combine; 1/3-cup chopped nuts; tablespoon minced pimentos; 3 tablespoons mayonnaise.

COCKTAIL

Split desired number of shrimp in halves, removing black vein. Place in cocktail or sherbert glasses. Chill. Immediately before serving add desired sauce.

CREAMED

Two cans shrimp, flaked; 2 cups hot white sauce; 1 hard cooked egg; 1 teaspoon minced parsley; 1 egg yolk; salt and pepper.

Mix sauce and egg yolk; add shrimp, parsley and seasonings. Cook over boiling water until very hot. Grate yolk and slice white of hard cooked egg. Stir slices into mixture. When ready to serve, sprinkle with grated yolk. Serves five.

CROQUETTES

Two cans shrimp; 2 tablespoons butter; 1 tablespoon minced onion; 1 tablespoon flour; 1 egg, 2 tablespoons cold water, crumbs; 1 egg, beaten; salt and pepper; cooking fat.

Melt butter, cook onion in this, add seasonings, flour, shrimp, and when cool add one egg. Form into cones. Egg and crumb and fry in hot fat. Serves four.

FRITTERS

Shrimp; fritter batter; cooking fat; salt and pepper.

If desired shrimp may be flaked. Season, mix with batter and drop by spoonful in hot fat (360° F.). Fry until brown.

DEVILLED

Two cans shrimp; 1 cup toasted bread crumbs; 1 tablespoon minced parsley; 1 small onion; ¼-teaspoon pepper; 1 teaspoon salt; 2 eggs beaten; 1 tablespoon minced sweet red pepper; 1 tablespoon fat; ¼-cup milk; 1 tablespoon butter.

Put shrimp and onion through food chopper. Add three-quarters of the crumbs, the parsley, red pepper, eggs, one tablespoon fat, salt, pepper, and milk to moisten. Place in greased ramekins, cover with remaining crumbs, and dot with butter. Brown in very hot oven (500° F.). Serves six.

FRIED

Required number of shrimp; salt and pepper; lemon juice; 1 egg, crumbs, 2 tablespoons cold water; tartar sauce; cooking oil.

Sprinkle shrimp with salt, pepper and lemon juice. Let stand 15 minutes. Egg and crumb. Fry in deep fat (360° F.) for three minutes. Drain and serve with tartar sauce.

GUMBO

Two cans shrimp; 2 cups hot water; 2 cups canned tomatoes; 16 okra, diced; 1 small onion, minced; ½-cup rice; 1½ teaspoons salt; 3 slices bacon, chopped; 2 tablespoons flour; ⅛-teaspoon cayenne; liquor from cans.

Saute bacon in a pan. Add onion and cook five minutes. Then add flour, stirring constantly until brown. Add tomatoes, water, okra, and shrimp. Season with salt and cayenne. Simmer one hour. Serve hot with rice, which has been cooked meanwhile in boiling salted water. If canned okra is used, it should be added 15 minutes before serving. Serves six.

JAMBALAYA

One can shrimp; 1 cup rice; 1 onion, chopped; cooking oil; salt and pepper; bay leaf; thyme; parsley, chopped; cup tomato juice.

Wash rice in cold water. Saute until golden brown with onion (in hot oil). Add shrimp, stirring constantly. When brown add tomato juice and enough water to just cover the whole. Season with salt, pepper, bay leaf, thyme, and parsley. Boil slowly, adding water until rice is well cooked. Serve hot.

SCALLOPED

Two cans shrimp; 1½ cups dry bread crumbs; 1 cup stewed tomatoes; 1 teaspoon salt; 1 cup canned corn; ¼-teaspoon pepper; 3 tablespoons butter; ¼-teaspoon paprika; 4 tablespoons shrimp liquor.

In the bottom of greased baking dish sprinkle thin layer of crumbs. Over this place half the corn and tomatoes, and sprinkle with seasoning. Dot with butter. Then lay half the shrimp over all. Repeat, then pour over liquor from shrimp and cover with remaining crumbs. Dot with butter and bake in hot oven (400° F.) 30 minutes. Serves six.

SPANISH

Three cans shrimp; 2 cups cooked tomatoes; 6 eggs; 6 green peppers; 3 cloves garlic; 1/3-cup olive oil; 1 teaspoon salt; ⅛-teaspoon pepper; dash of paprika; cooked rice; 3 large onions.

Flake shrimp, chop onions and garlic together, and shred peppers. Heat olive oil, stir in paprika, add onions and garlic, and fry to golden brown. Add peppers, seasonings, tomatoes and shrimp. If the mixture is too dry add extra tomato juice or water. Simmer slowly one hour and combine with slightly beaten eggs. Return to heat for two or three minutes without boiling. It should be stirred constantly. Serve with rice. Serves eight.

STEW WITH DUMPLINGS

Four cans shrimp, flaked; 1 cup diced potatoes; ½-cup diced celery; 1 tablespoon butter; dumplings; 2 tablespoons minced onion; 2 slices bacon, chopped; ½-cup diced carrots; 1 tablespoon minced green peppers; liquor from cans; salt and pepper; 2 cups stewed tomatoes.

Simmer ingredients for one hour. If necessary add more liquor or water. Drop in dumpings. Cover closely and cook 20 minutes. Serves eight.

CREAMED WITH GREEN PEPPERS OR CELERY

Two cans shrimp, halved; 2 cups white sauce; ½-cup green pepper or celery; toast or crackers.

Place sauce over hot water and heat with pepper and shrimp. Serve on toast or in timbales or puff paste cases. Serves six.

NEWBURG

One can shrimp; 4 tablespoons butter or oil; 1 cup cream; yolks 2 eggs, beaten; salt and pepper; 1 green pepper.

Saute shrimp in butter or oil. When done add cream, boil for three minutes. Stir in eggs until it begins to thicken, but do not again allow to boil. Garnish wtih strips of green pepper. Season. Serves six.

SALAD JELLIED

Two cans shrimp; 1 quart tomatoes; 1¼ cups water; 1½ teaspoons salt; ¼-teaspoon pepper; 4 cloves; 1 tablespoon sugar; 2 tablespoons granulated gelatin; ½-cup diced celery; ¼-cup diced green pepper; 1 bay leaf; mayonnaise; lettuce; 1 small onion, minced; 1 teaspoon dry mustard.

Cook tomatoes one cup water, salt, pepper, cloves, bay leaf, sugar, mustard and onion together for 15 minutes. Strain and pour mixture over gelatin which has been softened in ¼-cup cold water. Cool until it begins to stiffen. Add shrimp cut in halves, celery, and green pepper. Pour into wet individual molds and chill until hardened. When ready to serve, turn out on beds of lettuce and garnish with mayonnaise. Serves eight.

STUFFED PEPPERS

One can shrimp; 6 green peppers; 1 tablespoon butter or oil; ¼-tablespoon minced onion; ½-cup mushrooms; 2 tablespoons minced tomatoes; 1 teaspoon salt; ½-teaspoon minced parsley; ½-cup bread crumbs; butter.

Cut off tops of peppers, discard seeds. Parboil peppers Heat butter, add onion and tops of peppers (chopped) and let simmer until tender. Add mushrooms and let simmer; then add tomato, salt, parsley and shrimp. When all is heated together dust in crumbs. Fill peppers, put a piece of butter on each and bake 10 minutes in hot oven (400° F.). Serves six.

STUFFED TOMATOES

One can shrimp; 8 large tomatoes; ½-teaspoon chopped onion; 3 slices bread; ½-teaspoon salt; ½-green pepper minced; 1 tablespoon butter or oil; bread crumbs and butter; ½-teaspoon minced parsley.

Cut off the tops of tomatoes, scoop out centers, saving shells. Mix centers, onions, bread, parsley, salt, pepper and shrimp. Fry mixture in butter or oil until cooked, then put into tomato shells, sprinkle with bread crumbs and melted butter or oil; bake 20 minutes in a hot oven (400° F.) Serve hot. Serves eight.

It has long been observed that in regions where fish and seafood are regularly eaten in considerable amounts goiter is rare, whereas it is very common in many regions because of lack of iodine. Fish and seafood furnsh this element in appropriate amounts to supply the needs of the body. A similar statement may be made concerning rickets in children. Even in those parts of the world where climatic and hygienic conditions are such as to favor the development of bone defects, it is rare among children where fish and seafood form a prominent article of diet (U. S. Bureau of Fisheries.)

GRAND ECORE BLUFF

There is a place where Red river runs
Below the brow of a bluff
Whose steep and rugged walls are tinged
With gray and rose and buff.

The river winds in and the river winds out,
Its red waves kiss the shore,
While time and men are passing by
The bluff at Grand Ecore.

Atop of the bluff the aged pines
Are faithful night and day,
And the grass grows in the tented shade
Where the ghosts of the redmen play.

Across the river one can see
Green fields that travel far,
And a colony of willow trees
On a fluted white sandbar.

The sun comes up and the sun goes down
But the river goes on its way
Beside a pine-crowned bluff with walls
Of buff and rose and gray.

Though many a full moon's light has lain
Over the bluff's still breast,
And many a steamboat's low salute
Has echoed from its crest,

Yet the years have not marred its beauty,
Quaint in historic lore,
Though time and the tide and men pass by
The bluff at Grand Ecore.

—GRACE TARLETON AARON.

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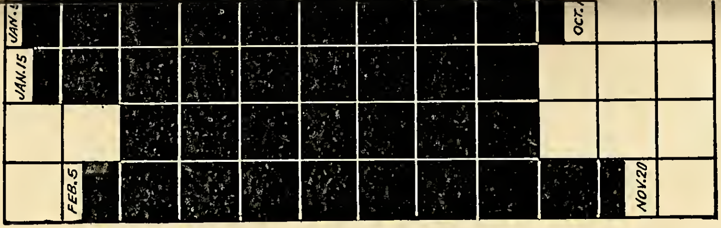
Louisiana Fur, Game, and Fish Laws, 1931-1932

■ BLACK SQUARES DENOTE CLOSE SEASONS ☐ WHITE SQUARES DENOTE OPEN SEASONS
NUMBERS IN SQUARES ARE OPEN DATES

MIGRATORY GAME BIRDS	JAN.	FEB	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP	OCT.	NOV.	DEC.	BAG AND POSSESSION LIMITS
WILD DUCKS Except Wood Duck	■	■	■	■	■	■	■	■	■	■	NOV.16	DEC.15	15. daily, 30 in possession at one time.
WILD GEESE	■	■	■	■	■	■	■	■	■	■	NOV.16	DEC.15	4 daily, 8 in possession at one time.
COOT (POULE D'EAU)	■	■	■	■	■	■	■	■	■	■	NOV.16	DEC.15	25 daily, 300 season.
SNIPE	JAN.15	■	■	■	■	■	■	■	■	■	□	□	20 daily, 240 season.
DOVE *	□	■	■	■	■	■	■	■	■	■	■	□	25 daily, 300 season.
WOODCOCK	■	■	■	■	■	■	■	■	■	■	■	□	4 daily, 22 season.
RAILS	JAN.15	■	■	■	■	■	■	■	■	■	□	□	25 daily, 300 season
GALLINULES	JAN.15	■	■	■	■	■	■	■	■	■	□	□	15 daily, 300 season.
SORA	JAN.15	■	■	■	■	■	■	■	■	■	□	□	25 daily, 300 season.
RESIDENT GAME BIRDS													
BOB WHITE (Quail or Partridge)	□	FEB.15	■	■	■	■	■	■	■	■	■	□	15 daily, 120 season.
WILD TURKEY	■	■	MAR.5	APR.5	■	■	■	■	■	■	■	■	1 daily, 5 season.
GAME ANIMALS													
DEER * Northern Zone	JAN.15	■	■	■	■	■	■	■	■	■	■	□	1 daily, 5 season.
DEER * Southern Zone	AN.5	■	■	■	■	■	■	■	■	■	□	□	1 daily, 5 season.



BEAR	1 daily, 5 season.
SQUIRRELS	10 daily, 120 season.
RABBITS	No limit, may be sold in open season.
FUR ANIMALS Muskrat, Mink, Opossum, Otter, Raccoon, Wolf, Fox, Skunk, Etc.	Trap limit 250, traps must be visited daily.

*DEER ZONES.—Northern: Concordia, Avoyelles, Rapides and Vernon and All Parishes North.
Southern: All parishes south.

HUNTER'S LICENSE PROVISIONS

LICENSE YEAR JULY 1 TO JUNE 30

HUNTING LICENSES:

Residents, all game birds and animals	$ 1.00
Non-residents, migratory game birds only	$25.00
Non-residents, game birds and animals	$50.00

TRAPPING LICENSE:

Residents only, does not allow hunting, good only in parish where trapping is done	$2.00

FISHING LAWS

FRESH WATER GAME FISH

KINDS	Size Limits	Creel Limits
BLACK BASS (green trout)	10 inches or more	20 daily
YELLOW BASS (striped bass)	7 inches or more	25 daily
WHITE BASS (barfish)	7 inches or more	25 daily
CRAPPIE, (White perch, speckled perch, sac-a-lait)	7 inches or more	25 daily
SUNFISH (perch, bream, goggle-eye, blue-gill, etc.)	5 inches or more	100 daily

CLOSE SEASONS AND CLOSE ZONES

No state-wide close seasons on game or commercial fish. Department of Conservation can authorize close seasons or close zones in any waters where necessary, otherwise fish can be taken at any time or place provided size limits and other restrictions are observed.

ANGLER'S LICENSE PROVISIONS

LICENSE YEAR JANUARY 1 TO DECEMBER 31

Resident, per annum	$ 1.00

Required of all anglers fishing for fresh and salt water game fish with rod and reel, artificial baits, spinners, or live natural baits. No license required when using dead natural bait or worms, grubs, clams, and mussels on ordinary pole and line.

Non-resident, per annum	$ 5.00
Tourists or transients limited to 7 consecutive days	1.00

Required of all non-resident anglers fishing for fresh and salt water game fish, irrespective of tackle or bait used.

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▫NOTICE—Federal Bag Limit of 15 ducks and 4 geese daily must be observed.

* Dove Season in Louisiana: December 1st through January 31st must be observed as only open season.

Louisiana Nature Guardians

"Upon my honor, as a Louisiana Nature Guardian, I promise to take care of all our natural friends, to guard and protect them to the best of my ability, and as far as possible influence others to do the same."

WHEN the Nature Guardian Club of Louisiana was formed several years ago, it met an instant and hearty response from the teachers and the school children all over the State. From a small interested group it has grown steadily into a mighty force of thousands of young conservationists. These children are the proud possessors of handsome lithographed badges, and certificates of membership. New Clubs are being formed each week and it is the purpose of the Educational Bureau to enroll every Louisiana boy and girl, white or colored, under the Nature Guardian banner.

HOW YOU CAN BECOME A NATURE GUARDIAN

YOUR PART

Consult your teacher.

Ask that the purpose and plans of the Nature Guardian Club be explained to you and the class.

Ask for an application card.

Get a responsible person to indorse it, after proving that you fully understand the duties of a Nature Guardian.

Sign the application and mail the card, postpaid, or give to your teacher, to send with cards from all the class.

OUR PART

We send the application card.

We send you a handsome badge, a certificate of membership, Nature Guardian pamphlets and other literature.

This is all free, and is carried on with the purpose of instilling into the children's minds a knowledge of Louisiana's wild life and a thorough understanding of its economic value to the State.

It also aims to develop individual humanitarianism. Even within this short time an amazing improvement has been made in the mental attitude of our young folks toward the conservation and protection of Louisiana's natural resources.

EDITORIAL

MY DEAR GUARDIANS:

By the time this is printed the Christmas holidays will be close at hand. At that season it is well to bear in mind the necessity for conserving our evergreen trees, that are used so lavishly for decorations in homes, schools, and churches. Many are the crimes committed against our natural resources at this time! The ruthless destruction of the trees and shrubs, carried on, is truly appalling. Young holly and yaupon trees are literally torn to pieces to supply the demand for Christmas greens.

Teachers should warn their pupils against such depredations, and each Nature Guardian should constitute himself a committee of one, to do all within his means to stamp out such vandalism.

Fifteen states have passed laws for the protection of their native plants. Such laws are difficult to enforce, and it remains largely a problem of individual effort, and influence, to put down careless destruction of Louisiana's beautiful pine, holly, and yaupon trees. Guardians, be on the alert to help protect them!

With love and best wishes for a Merry Christmas, and a Happy New Year, to each of you,

THE EDITOR.

A MEMORY

Give me trees where roadways trend,
With towering, sheltering arms;
Where joyously the wild birds sing,
And noisily the spaces ring
With notes of their love and alarms.

Oh give me a tree where the roadway bends,
That my soul may find release
From rasping cares of yesterday,
And trials of now that beset the way;
Surcharging with love and peace.

Give me a tree with its sheltering arms,
Wherever I chance to roam,
That seeing, I vision, early—late—
A tree that stood by the garden gate
Of childhood's home, sweet home.

—ISABEL LIKENS GATES.

Winnfield, La.,
Oct. 11, 1931.

Nature Guardian Editor,
Dept. of Conservation,
New Court Bldg.
New Orleans, La.

Dear Editor: I would like to become a member of your Nature Guardian Club. Please send application blank at once. I am anxious to join.

I will also try to introduce your club to all of my friends, and ask them to become members.

Yours truly,

LULA EVANS,
Winnfield, La.,
Route 1, Box 47.

Here comes Lula, knocking at the club door! Come in, and make yourself at home! You are very, very, welcome! Try to get all your friends to join, for being a Guardian is one of the finest things that can happen to a Louisiana boy or girl.

New Iberia, La.,
Oct. 8, 1931.

Dear Editor: We have a prosperous, Conservation Club, over here on the Teche. At our meeting officers were elected. Calyle Bourgeois, president, Loyd Boutte, vice-president, Dracos Burke, treasurer, and John Simon, secretary.

We have had several nice talks on the wild life and natural beauties of our beloved state. Most of these talks were given by members of the club. We have listened to a number of lectures by our instructor of biology, who is, at the same time, advisor of our club. Most of our work has been theoretical so far. However, many excursions have been made into the surrounding country, and we have seen many interesting things, among which were the large blue and white herons around Avery Island.

Every morning we have a beautiful song by the Louisiana mocking-bird, which sits on a tree just outside our class room, and entertains us with enchanting warbling. We were not aware of so many wonders in nature which surrounds us, but since we have become interested in Conservation, and after hearing in our club programs such nice and interesting things about them, we now realize more cur duty as future citizens of Louisiana.

The things which made our programs more interesting were the specimens of leaves and fruits of trees spoken of, the oyster, as displayed by the deliverer of the speech, "The Louisiana oyster," and pictures of birds etc., . . . which were the object of the talks.

The conservation literature is in constant use, and much profit is being drawn from its perusal. We are very thankful to you for taking the trouble of sending us so many pamphlets on this subject. The Conservation Review is much appreciated.

Yours truly,

JOHN SIMON,
Secretary.

Guardians, The Teche Conservation Unit, of which John is the secretary, is doing a wonderful service for conservation. Let us hear from John from time to time, how the work is progressing. If you have not a copy of the "Nature Guardian Manual for Supervisors," and a copy of our "Lectures on Natural Resources," please send for them, for they will help you materially in the administration of your unit.

WILD GEESE

How oft against the sunset sky or moon
I watched that moving zig-zag of spread wings
In unforgotten Autumns gone too soon,
In unforgotten Springs.
Creatures of desolation, far they fly
Above all lands bound by the curling foam;
In misty fens, wild moors and trackless sky
These wild things have their home,
They know the tundra of Siberian coasts,
The tropic marshes by the Indian seas;
From Crux to Pleiades.
Dark flying rune against the western glow—
It tells the sweep and loneliness of things,
Symbols of Autumns vanished long ago.
Symbols of coming Spring.

CHRISTMAS

Old Father Christmas is coming South soon,
Driving his reindeers and sleigh;
He is putting the names on his boxes of toys,
And tying up bundles so gay!

There is something, I'm sure, for each one of you
That you've wanted and wished for so long,
It's tied with bright ribbons and has your address,
So plain it can never go wrong.

When Christmas Eve comes, you must close your eyes tight
And never, oh *never*, must peep!
But just tell your mother and father good night
And cuddle down quickly to sleep.

Old Santa Claus works while other folks rest,
And a mighty big job he has, too.
To deliver on schedule each gift in his pack,
Is something that's quite hard to do.

Now, Guardians, you all must be very good,
At home, and at school, and at play,
And Santa will surely reward every one,
With presents on glad Christmas Day.

E. V. COTTMAN.

August, 30, 1931.

Dear Editor: I would like to join the nature guardians, so I am sending my card to you.

I have three pets. One cat and two puppies. One afternoon we were sliding. One of our puppies is named Kate. We led her up the ladder and down the slide once. Then she went up the ladder and slid down just as we did.

Respectfully,

EDNA CARROLL,
Gilbert, La.

Such a smart puppy! I am sure you love her very much, Edna!

The following "OPINION" by Edgar Guest is appropriate:

"Well it's queer," said he, "but you seldom find
A lover of trees in a prison cell,
Or doing a wrong of any kind;
It's in stuffy rooms the criminals dwell.

"I've watched the world and the ways of men,
And those who are bronzed by the summer sun,
And know the secrets of field and glen,
Aren't apt to be near when wrong is done.

"For crime is bred in the crowded streets,
But the man who bothers with plant and tree,
And is friend to the humblest flower he meets,
Is likely a friend to man to me."

---

322 France St.,
Baton Rouge, La.,
August 28, 1931.

Dept. of Conservation,
124-126 New Court Bldg.,
New Orleans, La.

Dear Friends: May I join your happy club? My sister belongs to it and I, too, would like to join.

I am thirteen, with dark hair, blue eyes, a freckled nose, and am five feet tall. I love all animals.

Yours truly,
MARGARETE BUDDE.

Yes, Margaret, you may join! We are glad to have you!

We welcome the following new members:

Rosemary Morgan,
Route 2, Box 36,
Rayville, La.
Robbie Spruell,
Box 321,
Rayville, La.
Ray Cromwell,
Indress, La.
Pearlie Brown,
Mangham, La.
Lizzie Mae Jones,
Mangham, La.
Velma Candlish,
Red Hill Pl.,
Box 343,
Delhi, La.
John Dixon,
Dunn, La.
Mary Eliz. Burgess,
Dunn, La.
Ruth Leverne Welch,
Dunn, La.
William Cothran,
Dunn, La.
Minnie Butler,
Dunn, La.
David Luther Welsh, Jr.,
Dunn, La.
Ida Bell Kay,
Dunn, La.
Wm. Albert Green,
Dunn, La.
Hiram Berry Sanders,
Oak Grove, La.
Eddie Lee Stevenson,
Rayville, La.

We shall be glad to hear from our members at any time, and shall be glad to print their poems, themes, and letters about any of the natural resources of Louisiana. We hope that our next issue will contain many interesting articles by members of our Club.

Address all letters to: NATURE GUARDIAN EDITOR, DEPARTMENT OF CONSERVATION, NEW Court Building, New Orleans, La.

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General Effects of Salt Water on Plant and Animal Life

By CLARENCE P. DUNBAR
Palaeontologist, Minerals Division,
Louisiana Department of Conservation

THIS ARTICLE has been prepared in answer to numerous requests for information relative to the effects of salt water upon the various forms of plant and animal life. Much has been written upon this same subject, but as usual, the content of such articles are far from being comprehensive to the ordinary layman. Therefore, an attempt has been made to present this article in such a manner that will be helpful, and enlightening to all, whether they be concerned with the uses of water for agricultural or industrial purposes, or, merely for domestic consumption. The tables at the conclusion of this article, show comparative analyses of salt and fresh water throughout the State.

To the statement that of all the natural resources of Louisiana, water is one of the most important, we feel everyone will agree. It is, indeed, strange then, that, on the whole, so little thought is given to the matter of water supplies, unless forced to the attention of the public, through an impending shortage; the supplies becoming saline and destroying crops and damaging land; becoming discolored through a mixture of oil or organic matter; and becoming contaminated, and bringing about death to fish, and animal life.

There are various methods used in the disposal of oil field waters; first, by evaporation ponds; second, evaporation for recovery of dissolved constituents; third, diversion into surface streams, and fourth, the return to sub-surface formations. Of these different methods the first and third methods, or combinations of these two, are used in this State. When the salt water is not found in too large quantities, it is allowed to flow into swamps, sloughs, and eventually finds its way into the various flowing streams, in a much diluted form. In other places the water is impounded into ponds, and held until periods of heavy rainfall, and the consequent flood conditions of the streams, during which time these ponds are drained, and the excessive dilution of the salt water by fresh rain water, reduces the damage to soil, and vegetation, to a minimum.

Quoting *Schmidt* and *Devine,*[1] "Damages to the soil due to the overflow of salt water may not be permanent. Many abandoned oil leases are now under cultivation which apparently have suffered no detrimental effects to that portion of the property subjected formerly to the overflow of salt water. The reclamation of previously damaged soil is probably due to the leaching out of the various salts by rainfall." Quoting *Scofield* again, "When the salt content of the soil is 0.5 per cent and the moisture content is 25 per cent it might be assumed that the salt content of the soil solution would be 2 per cent. On the other hand, if the salt content is 0.5 per cent and the moisture content is 10 per cent then the salt content of the soil solution would be 5 per cent."

"It is the consensus of opinion among investigators that the roots of ordinary crop plants can not tolerate concentrations of mixed salts in solution much above 1.5 per cent. Notwithstanding this, many instances are reported of crop plants making fair growth in soils which show by analysis as much as 0.5 per cent of salt to the dry weight of the soil, and when the moisture content frequently falls as low as 15 per cent. Such observations have led to the conclusion that when the soil solution becomes very concentrated through the loss of water by evaporation, some of the salt may be reabsorbed in some way by the soil."

The harmful effect of oil fields resulting from pollution, depends largely upon the ultimate salt concentration of the water. If salt water is allowed to drain into a large stream, it causes little or no damage, because the ultimate concentration would be low, but if a similar amount of oil field brine be allowed to drain into a small stream, the ultimate concentration of salts would be high, and make the water unsuitable for human or animal consumption.

Quoting *Ramsey,*[2] "First, Horses will thrive on water containing up to 5,720 p.p.m. sodium chloride and 7,860 p.p.m. total solids. Provided they are not worked, they may be sustained on water containing up to 9,140 p.p.m. sodium chloride and 13,600 p.p.m. total solids. Second, Cattle will thrive on water containing up to 11,440 p.p.m. sodium chloride and 14,300 p.p.m. total solids. Third, Sheep are affected by sodium chloride in an analogous way to cattle, and the limits of concentration are approximately the same."

---

[1] *Schmidt* and *Devine,* The Disposal of Oil Field Brines, Department Commerce—Bureau of Mines Serial 2945, June, 1929.

[2] *Ramsey,* A. A. Water Suitable for Livestock. Agricultive Gazette of New South Wales, May, 1924. (U. S. Bureau of Mines Serial No. 2945).

"From the data[3] obtained so far it is evident that livestock, particularly cattle, are not seriously affected unless the brine contains injurious salts such as barium, or unless the salt concentrations or total solids are exceedingly high. In this connection attention might be called to a well in Upton County, Texas, which produced only salt water. When preparations were made to abandon the well it was purchased by ranchers in the vicinity. The salt water is allowed to flow through a ditch (about 7 miles long) located on the ranch, and the cattle are watered from this ditch. According to the foreman of the ranch, the cattle thrive on the water. This water has been used by cattle for about two years with apparently no ill effects. There is no fresh water supply available on that particular range. It may be of interest to note that deposits, principally of magnesium and calcium carbonates, have formed for about 2 miles along the upper end of the ditch. At the well-head the deposits are principally sulphur, silica, and some iron.

A considerable amount of experimental work has been done with reference to the effect of Salt Water on fish life. Quoting *Schmidt*, "No general statement can be made regarding the maximum concentration of salts in which fresh-water fish can live, for this depends on the species of fish as well as on other factors." In a personal communication the Bureau of Fisheries states: "The top minnow, *Gambusia*, may be plunged directly from fresh water to sea water without any apparent ill effects. Again, such typically fresh-water fishes as the black bass, the brook trout, and the carp, are known to live and thrive well in brackish, and even salt water, under natural conditions where the fish is free to choose its own environment. On the other hand, salt-water fishes may be killed by a too-great saline concentration."

"A number of laboratory experiments have been described in regard to the tolerance of fishes for sodium chloride, but the results recorded are quite conflicting."

"Besides the variation in tolerance to sodium chloride with the species, other important factors which modify the effects of salt are temperature, the amount of oxygen in solution, and the hydrogen concentration."

"Calcium chloride seems to be much more lethal in its effect than sodium chloride. According to the Bureau of Fisheries, a 1 per cent solution of calcium chloride (3,600 p.p.m. calcium) at 20°C caused distress of tench, which are noted for their tenacity of life, after a period of three hours and five minutes. The tench were removed to fresh water and died 3 days later. However, a one-tenth of 1 per cent solution of calcium chloride (360 p.p.m. calcium) had but slight effect upon trout and tench when the temperature of the water was 6°C.

"Numerous investigators have shown that many fresh-water fish will die if subjected to the action of water of high salinity; the ill effects are largely attributed to the unbalancing action of water of greater specific gravity, a diminution of some of the essential food, and also, a tendency toward loss of water from the body of a fresh-water fish when placed in a salt solution; this latter phenomenon is explained by the theory of osmosis. As for the concentration, Marsh found that bass transferred from fresh water directly into sea water (sodium chloride approximately 35,000 p.p.m.) died in a few minutes. However, a transfer of bass and perch from fresh water to a sodium chloride solution, containing approximately 14,000 p.p.m., failed to produce any fatalities in 14 days."

Salt water is not suitable for drinking purposes, and has a certain detrimental effect on waters used for household and industrial purposes. Quoting *Schmidt*,[4] "No definite statement can be made as to what maximum concentration of dissolved substances a water may contain, and still be utilized for human consumption, stock water, and industrial purposes. The Bureau of Public Health Service adopts as its upper limits 250 p.p.m. chloride and 1,000 p.p.m. total solids for drinking water. For industrial purposes the addition of large amounts of oil field brines to a stream will, of course, increase the calcium and magnesium content, and thus increase both the total and permanent hardness of the water. Softening this water is an added cost to industries."

In general, the chlorides of sodium, magnesium, and calcium, predominate in the oil field waters of Louisiana. Combinations of sulphate and bicarbonate are not unusual, and in addition, some of the brines carry small amounts of the rarer salts, such as bromides, and iodides. Table 1 gives a partial chemical analyses of a few of the formations, which are fairly representative of the several leading oil producing formations of North Louisiana. In comparison to the salt water analyses, Table 2 gives a partial chemical analysis of shallow well waters in various parts of the State.

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[3] The Disposal of Oil Field Brines, U. S. Bureau of Mines, Serial No. 2945.

[4] *Schmidt* and *Devine*, The Disposal of Oil Field Brines, Bureau of Mines Serial No. 2945.

TABLE NO. 1.

ANALYSES OF WATER SAMPLES OBTAINED FROM DIFFERENT FORMATIONS IN VARIOUS OIL AND GAS FIELDS OF LOUISIANA*

Parish	Caddo	Caddo	Webster	Webster	Bossier	Caddo	Webster	Webster
Field	Caddo	Caddo	Cotton Valley	Cotton Valley	Elm Grove	Pine Island	Cotton Valley	Cotton Valley
Geological Formation	Natchitoches	Eagleford	Blossom	Woodbine	Woodbine	Trinity	Glen Rose	Lower Trinity
Depth	1006 ft.	1861 ft.	2550 ft.	3300 ft.	2570-80 ft.	3717-22 ft.	4600 ft.	6888 ft.
Parts per Mil	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M	P.P.M	P.P.M.	P.P.M.
Calcium (CA)	262	609	1,653	1,018	2,398	16,549	13,534	12,340
Magnesium (MG)	167	289	508	6,890	342	4,062	1,741	1,358
Sodium (NA)	8,979	13,404	23,934	16,928	14,859	52,240	49,559	34,158
Bicarbonate (HCO_3)	756	384	180	.....	61	85	21	73
Sulphate (SO_4)	Trace	....	....	....	165	535	606	592
Chloride (CL)	14,360	22,338	41,221	47,998	28,011	121,263	105,047	78,006
Total Solids	24,235	40,860	1,027	72,715	48,700	197,800	107,520	126,527
Specific Gravity	1.014	1.027	....	....	1.035	1.133	....	....

*Analyses by Department of Conservation, Minerals Division.

TABLE NO. 1—Continued.

ANALYSES OF WATER SAMPLES OBTAINED FROM DIFFERENT FORMATIONS IN VARIOUS OIL AND GAS FIELDS OF LOUISIANA*

Parish	Richland	Morehouse	La Salle	La Salle	La Salle	Bossier	Sabine	Sabine
Field	Richland Gas Field	Monroe Gas Field	Urania	Urania	Urania	Carterville	Zwolle	Zwolle
Geological Formation	Gas Rock	Lower Cretaceous	Cane River	Cane River	Cane River	Blossom	Upper Cretaceous	Upper Cretaceous
Depth	2465 ft.	2636-45 ft.	1550 ft.	1600 ft.	1610 ft.	2680 ft.	2350 ft.	2178 ft.
Parts per Mil	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.
Calcium (CA)	320	4,512	460	550	254	1,204	576	400
Magnesium (MG)	127	320	....	....	141	98	76	105
Sodium (NA)	8,982	33,426	14,900	16,650	10,687	20,745	15,720	14,000
Bicarbonate (HCO_3)	439	....	....	......	561	61	366	518
Sulphate (SO_4)	....	....	....	..	....	Trace	380	285
Chloride (CL)	15,600	60,277	26,592	31,556	17,019	34,393	24,997	22,100
Total Solids	25,414	99,780	38,481	46,400	28,028	58,200	41,960	36,100
Specific Gravity	....	1.060	1.031	1.033	1.020	1.039	1.028	1.024

*Analyses by Department of Conservation, Minerals Division.

TABLE NO. 2.

ANALYSES OF WELL WATERS USED FOR DOMESTIC AND INDUSTRIAL PURPOSES IN VARIOUS PARTS OF LOUISIANA*

Parish	Caddo	Bienville	Sabine	Bossier	St. Landry	Evangeline	Jefferson Davis
Town	Lakeview	Bryceland	Converse	Red Chute	Rosa	Ville Platte	Jennings
Depth	260 ft.	20 ft.	339 ft.	300 ft.	135 ft.	275 ft.	375 ft.
Parts per Mil	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.
Calcium (CA)	6.4	11.2	Trace	4.0	84.1	50.1	16.0
Magnesium (MG)	3.3	11.8	Trace	Trace	27.8	18.3	3.9
Sodium (NA)	126.7	9.3	455.8	196.6	60.9	34.5	16.3
Bicarbonate (HCO_3)	66.0	18.3	780.8	341.6	500.2	280.6	61.0
Sulphate (SO_4)	12.5	30.0	Trace	16.7	11.1	Trace	1.6
Chloride (CL)	191.4	35.4	191.5	99.2	24.8	31.9	28.3
Total Dissolved Solids	668.0	194.0	960.0	500.0	457.0	263.5	180.0

*Analyses by Department of Conservation, Minerals Division.

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TABLE NO. 2—Continued.

ANALYSES OF WELL WATERS USED FOR DOMESTIC AND INDUSTRIAL PURPOSES IN VARIOUS PARTS OF LOUISIANA*

Parish	Pointe Coupee	St. James	West Feliciana	Washington	Tangipahoa	St. John the Baptist	St. Tammany
Town	Red Cross	St. James	St. Francisville	Franklinton	Amite	Garyville	Folsom
Depth	135 ft.	324 ft.	90 ft.	790 ft.	450 ft.	350 ft.	1425 ft.
Parts per Mil	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.	P.P.M.
Calcium (CA)	11.0	93.2	7.0	11.0	4.0	101.2	4.0
Magnesium (MG)	1.0	28.4	2.6	2.4	3.3	29.0	1.1
Sodium (NA)	187.8	61.8	8.9	9.7	15.4	330.4	46.5
Bicarbonate (HCO_3)	390.4	518.5	36.6	42.7	36.6	280.6	103.7
Sulphate (SO_4)	Trace	17.9	1.3	13.2	3.6	Trace	19.7
Chloride (CL)	85.1	28.4	12.4	7.0	17.7	609.9	7.1
Total Dissolved Solids	475.0	425.0	98.0	118.0	58.0	1400.0	119.0

*Analyses by Department of Conservation, Minerals Division.

FERTILIZING SHADE TREES

(*Continued from page 12*)

Vinca minor allows one to add, from time to time, leaves, manure, peat, or other humus-forming materials, into which these shallow roots can grow. And yet the crowns of the plants form a permanent and protecting cover still a few inches above the shallowest roots. The addition of nitrogen is especially necessary in connection with mulches, since the bacteria, causing decay of the mulch material, make heavy demands on the nitrogen supply. This may result in a scarcity of this element for the tree.

The proper chemical fertilizers can be applied safely, and with benefit, from early spring to late fall, or even during the winter, if the ground remains unfrozen. With some horticulturists there remains a fear that almost any cultural treatment applied in midsummer is very likely to cause a forcing of late growth, which will be winter injured. This, presumably, is due to experience with tender shrubs, perennials, or possibly some fruit tree, such as the peach. The evidence, however, in the literature on fruit trees, gives no definite ground on which to base a fear of using moderate amounts of chemical fertilizers in midsummer. Certainly, with the majority of shade trees, no evidence exists to show that midsummer applications are anything but beneficial.

Until recent years, horticulturists, quite generally, believed that nitrogen applied late in the fall would not be taken up by the tree, and would be leached out, and lost during the winter months. Without discrediting the evidence that nitrate nitrogen does leach out readily, there is evidence to show that trees can take up nutrients which they need even after leaf fall. From this, and from numerous experiments, it has been well demonstrated that late fall applications of nitrogen are as efficient and beneficial as when similar materials are applied in the spring.

It seems well to touch on one other misconception still met with at times. This is the fear of using chemical fertilizers on conifers, or other evergreen species. It is true, especially with the shallow-rooted species, that the use of mulches and ground covers is particularly applicable to the growing of conifers. These treatments, however, cannot supply the needed elements if the soil is poor. As a result, both research, and practical experience, in most cases, have shown only excellent results from the proper use of fertilizers on conifers.

CORRECTION

The articles entitled Scenic Algoma in our October Issue, and What Are National Parks, in the November Issue, were reprinted by courtesy of *American Forests*. Through oversight we neglected to mention this fact.

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The Probable Cause of "Iodine Shrimp"

By
JAMES NELSON GOWANLOCH
Chief Biologist, Bureau of Research,
Department of Conservation
of Louisiana.

ONE of the very practical problems which repeatedly arise in the commercial marketing of shrimp from the Gulf Coast is the occurrence at times of what is known as "iodine shrimp" or "iodoform shrimp." Everyone who has eaten such shrimp will recall the pronounced taste resembling iodoform. This taste and odor oftentimes develops only after the shrimp have been boiled, and is not always strongly noticeable in the fresh condition.

Two popular explanations of the shrimp are current in New Orleans. The first is the completely erroneous idea that the iodoform odor is due to iodoform, formaldehyde or some other preservative, deliberately added to the shrimp by the dealer to preserve them. This idea has no basis, since the only thing used to preserve shrimp for market is ice. The addition of such preservatives would indeed be highly undesirable.

The second explanation commonly given is that the shrimp have been eating sea weed, an idea probably derived from the well known fact that sea weeds are rich in iodine.

When the writer began the study of shrimp in the Louisiana waters and first encountered these iodine shrimp, a possible explanation of this condition instantly occurred to him, and it is the purpose of this brief article to set forth this probable cause in a purely tentative manner, since it must be clearly understood that the experimental work to prove or disprove this explanation is not yet completed. It is the belief of the writer that the taste and odor of iodine shrimp are due to the fact that the shrimp concerned have been feeding upon a certain worm-like marine animal, the acorn worm, or to give it its scientific name, Balanoglossus.

Balanoglossus has a remarkably powerful iodoform odor and taste. From experience the writer has found that after handling Balanoglossus the odor will linger on the hands even after repeated washing. The fact that the condition is more apparent after the shrimp have been boiled is natural, since the operation of boiling tends to carry the taste and odor from the partly digested Balanoglossus in the alimentary tract of the shrimp and permeate the shrimp's entire body.

Very little indeed appears to be known about the food of the shrimp, and the present investigation, it is hoped, will do much to fill in this and many other gaps in our knowledge of these important commercial species· Careful studies are being conducted toward this end.

The writer has found, however, reference to the effect produced in certain commercial fish by their feeding upon Balanoglossus. This evidence has a definite bearing upon the present problem. Hildebrand and Cable, in studies of some of the important food and other fishes at Beaufort, North Carolina, found in their work on the common Croaker, *Micropogon undulatus,* that this fish often feeds upon Balanoglossus and acquires the typically strong iodoform odor and taste. They write as follows: "In addition to the foods reported in the literature cited, the Croaker, during the summer, not infrequently includes Balanoglossus, a worm-like chordate strongly scented with the odor of iodoform, in its diet. The odor and taste of Balanoglossus penetrates the flesh of the fish making it quite unpalatable. Such fish are locally known as being 'ticky.'" ("Development and Life History of Fourteen Teleostean Fishes at Beaufort, N. C.," by Samuel F. Hildebrand and Louella E. Cable, Fisheries Document No. 1093, from Bulletin of the Bureau of Fisheries, Volume XLVI, 1930.) They also report that Balanoglossus is eaten by the Pigfish, *Orthopristis chrysopterus,* and state that "the worm-like chordate, Balanoglossus, which scents the flesh and gives it an unpleasant flavor," was found in one of the 108 Pigfish examined.

Balanoglossus is an animal of unusual interest. When first discovered by Eschschaltz in the Marshall Islands in 1825 it was believed to be a worm-like sea cucumber. In fact it does look like a primitive worm· Kowalevsky in studies some forty years later supplied further information upon the basis of which Balanoglossus was then placed among the worms. In the '80's of last century the English zoologist, Bateson, through his studies of the embryology of the animal, first made clear that this lowly creature, so degenerate and altered in its structure, actually belongs to the same group of animals, the *Phylum chordata,* that embraces fishes, reptiles, birds, and mammals.

Balanoglossus undergoes two different types of development, some species by direct development, acquiring the adult form through a succession of gradual stages, others passing through an indirect development involving the appearance of a most peculiar stage, the "tornaria" so curious in its form that it was first believed to be a young stage of Star-fish or Sea-urchin. Balanoglossus is widely distributed, yet such are its habits that it may escape the notice even of scientists working in the area where it occurs. It typically spends its life buried in mud or sand. In the course of some research work on the Acorn-worm, which was conducted by the writer at the Biological Station of the Carnegie Institution of Washington, located at the Dry Tortugas in the Gulf of Mexico, 76 miles west of Key West, Balanoglossus was found to be extremely abundant in shallow muddy bays, although the discovery of its presence was quite accidental and its adult occurrence had not been reported before that time by any of the scientists who had for the previous twenty-five years been carrying on work at that place. So numerous were the Acorn-worms that it was possible in a few minutes to collect over a hundred living specimens, from six to ten inches in length.

Acorn-worms occur widely throughout the world, from Greenland to New Zealand, and from Africa to Alaska. Because of their secretive habits, which have been indicated above ,their presence can usually be ascertained only as a result of a direct, definite search for them.

Any scientific account of the anatomy of the Acorn-worm is out of place in the present brief article. It is probably sufficient to say that the worm is very soft and has remarkable frill-like folds. In color it is pale yellow. Its tissues are so soft that it would be a difficult matter to identify pieces in the digestive system of the shrimp, especially since in its feeding habits the shrimp manages to reduce the materials it eats to very fine bits.

Balanoglossus derives its name of "Acorn-worm" from the curious acorn shaped proboscis by means of which it works its way through the sand. Balanoglossus resembles the earth-worm in that like the earthworm it eats the mud or sand through which it travels and digests from this material any nutriant substances which happen to be present. The mouth is kept permanently open by means of the skeleton horn-like structures referred to below. The rest of the animal has undergone such profound degeneration that superficially it no longer remotely resembles a typical chordata.

The tissues are so very frail that it is difficult to remove the worm even from soft sand without tearing it. In fact the only hard structures present are two skeletel processes supporting the proboscis.

There is no reason to believe that this unpleasant flavor is in any way injurious to the person eating the shrimp. In fact the reverse might well prove to be the case· However, there is a natural distaste for "Iodine shrimp," increased further by the mistaken idea above referred to, that the taste is due to some chemical preservative that has been added to the shrimp in marketing them.

The Southern Canners Exchange has submitted to the Bureau of Research a long series of extremely important questions, the answers to some of which are now, as a result of the present investigation, becoming clear. As a matter of fact, the Exchange's series of questions enumerates problems that had already been set down as objectives when the present shrimp investigation was initially planned.

Americans Shell the English Hen With Oyster Shells

Very recently America shipped England some 15,000 bags of oyster shells to South Hampton for the English hens' encouragement towards more eggs as well as stouter shells. Resulting in the following poetical effort, published in the Manchester Guardian:

"Alas, alas, where will it end,
This Yankee tide that rises?
We speak their slang, their films attend,
Their golfers pinch our prizes.
And now the British hen as well
(I note with eye grown moister)
Requires the trans-Atlantic shell
As shed by Yankee oysters.

"I call it treason doubly dyed,
Oh shame upon these califfs!
Are there no shells to be supplied
By genuine English natives
Shall Colchester be wrapped in gloom,
Is Whitestable to languish,
While alien shells our hens consume,
Without a trace of anguish?

"Oh, bitter news for patriot hearts,
Black day for England's lover,
The British egg, though good in parts,
Will wear a foreign cover;
And when the dawn is cold and blue,
The British cock, poor noodle,
Forgetting "Cock-a-doodle-do,"
Will strike up "Yankee Doodle."

Gasoline Refineries in Nation Running Below Full Capacity

Demand Not Heavy Enough to Warrant Output of Plants, Says Bureau of Mines

VERY few gasoline refineries have operated at capacity for any length of time within the past year or two, since during the past 10 ten years refining capacity has grown more rapidly than the consumption of refined products, the Bureau of Mines of the Department of Commerce, has just announced. The potential capacity of refineries has increased several fold during the period, outstripping even the rapid growth of demand for the product.

Refineries in 1930 averaged operation at 69 per cent of capacity with a daily average throughout of 2,541,000 barrels of crude.

The importance of refineries located in or near producing fields will be increased with the development of the pipeline system of transportation, which received its first great impetus in 1930, and bids fair to become an increasingly important factor, the Bureau said.

The Bureau's statement follows in full text:

There were 435 completed petroleum refineries in this country on Jan.1, 1931, according to a survey made by the United States Bureau of Mines, Department of Commerce. This figure compares with 412 refineries on Jan. 1, 1930. The number of refineries reached its peak in 1923 and 1924, after which there was a more or less steady decline until 1930, when the number of plants constructed considerably exceeded the number dismantled.

The total daily capacity of all refineries on Jan. 1, 1931, amounted to 3,987,685 barrels, of which 3,706,610 barrels or 93 per cent, represents the capacity of the operating plants; 236,075 barrels, or 6 percent represents the capacity of the inoperative plants, and 45,000 barrels, or 1 per cent, represents the capacity of 10 plants under construction. These data as compared with Jan. 1, 1930, represent increases in capacity as follows: For total capacity, 5 per cent for the capacity of operating plants, 2 per cent; for inoperative plants, 81 per cent and for plants under construction 21 per cent.

The total capacity of the operating plants has increased steadily since the first complete survey of refineries was made as of Jan. 1, 1920, states G. R. Hopkins and E. W. Cochrane in a report recently issued by the Bureau of Mines. During the 10-year period, 1921-1931, the capacity of the operating plants increased 107 per cent.

When it is considered that during this same period the production of crude increased 102 per cent, it would not appear that there had been an over-expansion in refining facilities. However, when gasoline production is compared with refinery growth, it becomes evident that the refining capacity has grown more rapidly than the consumption of refined products. The potential capacity of the refineries to produce gasoline has increased several fold in the last 10 years, even outstripping the rapid increase in demand for this product. This has made it necessary for most refineries to curtail their operations, and there are very few plants which have operated at capacity for any length of time within the last year or two.

For the year 1930 the average total capacity of the operating plants amounted to 3,673,000 barrels, and their daily average crude throughout was 2,541,000 barrels. This indicates that the refineries operated at an average of 69 per cent of their capacity. In 1928 and 1929 the refineries operated at an average of 79 and 78 per cent of their capacity, respectively, which indicates a steady growth in the amount of idle equipment.

On Jan. 1, 1931, there were refineries in 30 States. There is a small plant located in the Katalla field of Alaska, but this plant is not included in the Bureau of Mines survey. Texas continued to lead in the number of refineries, with 98; California was second in number, with 69. From the standpoint of capacity California ranked first, with a total of 927,180 barrels, as compared with a total capacity of 860,875 barrels for Texas. Although the plants located on the Texas Gulf coast compare favorably in size with the largest found

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in California, the large number of small skimming plants in north Texas greatly reduces the average. Practically all of the State recorded an increase in total capacity in the year 1930. This resulted both from the construction of new plants and through the enlargement and modernization of others.

Refineries usually are constructed in the producing fields near the source of raw material or at the end of transportation systems near the consuming centers. The trend has been toward locating them near the points of consumption since in this way the extensive transportation of refined products is partially avoided. A number of refineries were built in the producing fields in 1930, and it is probable that plants will be located in this manner as long as flush fields are found and cheap crude is available. The transportation of gasoline by pipe line received its first great impetus in 1930. This method of transportation bids fair to become an increasingly important factor in the petroleum industry, in which case it will tend to increase the relative importance of these refineries located in or near the producing fields. The discovery of flush production in east Texas in the closing months of 1930 led to the construction of a number of these plants in the early part of 1931.

The construction of refineries in thickly settled districts in 1930 was centered in Ohio where four refineries of 32,000 barrels total capacity were building at the end of the year. The smallest of these plants was built to operate on crude oil produced within the State; one at Toledo will operate wholly or partly on Michigan crude, the remaining two will utilize Mid-Continent crude brought to them by a pipe line built particularly for that purpose.

The year 1930 witnessed the partial decline of west Texas as a refining center. The building of refineries in that area constitutied an important part of the construction program in both 1928 and 1929. However, on Jan. 1, 1931, 9 out of a total of 21 plants in west Texas were shut down. Part of the large amount of material moved from west Texas to east Texas in the early months of 1931 consisted of refinery equipment.

Skimming plants, or plants which produce gasoline and fuel oil or gasoline, kerosene, and fuel oil, continued to rank first in point of number. The number of skimming plants rose from 242 on Jan. 1, 1930, to 259 a year later. Second to the skimming plants in point of number were complete plants, or plants which produce all of the major petroleum products, including wax and asphalt when these elements are present in the crude oil used. However, from the standpoint of capacity the plants of the "complete" type easily ranked first, having a total capacity of 1,953,980 barrels as compared with a total of 1,293,280 barrels for the skimming plants. The third most important type of refinery, both from the standpoint of number and capacity, was the so-called skimming and lube plant. These plants operate like ordinary skimming plants but, in addition, process their reduced crude for lubricating oils. If wax is present, it is not finished but is thrown back into cracking stock or fuel oil. If asphalt is present in the crude in quantity, it is usually finished for the market, thus we have such types of plants as skimming and asphalt, skimming, lube and asphalt, and, if the crude used is extra heavy, the plants produce only fuel oils and asphalt. The number of plants having equipment to process lubricating oils fell from 127 on January 1, 1930, to 117 on January 1, 1931.

In spite of the low price of crude for skimming, cracking continued to expand during 1930. The production of gasoline by this method rose from 143,727,000 barrels in 929 to 164,243,000 barrels in 1930, a gain of 14 per cent. The total daily charging capacity of the cracking plants as of January 1, 1931, amounted to approximately 1,840,000 barrels, an increase of about 8 per cent over the previous year. This increase resulted principally from the expansion and replacement of existing units, but a number of plants installed cracking equipment for the first time in 1930. The number of refineries possessing cracking equipment rose from 201 on January 1, 1930, to 221 on January 1, 1931. Complete details as to the number of capacities of cracking units will be published shortly by the Bureau.

Perhaps the most important accomplishment of 1930 was the increase in gasoline yield of from 39.3 per cent in 1929 to 42.0 per cent in 1930. This could not be called outstanding since the yield of gasoline has shown a gain every year since statistics were first compiled by the Bureau of Mines. The chief factor leading to increase in gasoline yield in 1930 probably was the further gain in the use of pipe stills and bubble towers. A number of new pipe stills were installed and some shell stills were made to operate like pipe stills by installing a series of pipe coils within them. A number of refiners use shell stills for rerunning or for primary distillation in conjunction with a system of bubble towers. A number of refiners installed vapor recovery systems and the yield of the light products, particularly gasoline, was increased thereby.

In general, the trend in number of inoperative plants reflects economic conditions in the oil industry. For example, the refinery survey of 1920

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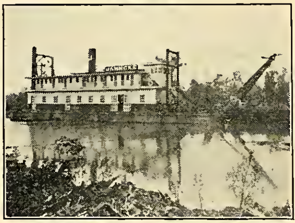

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showed comparatively few inoperative refineries and the number of plants under construction, presumably built because of the high prices for refined products, totaled 99, the highest ever recorded. From 1920 through 1924 there was a gradual increase in number of inoperative plants, reflecting the sharp reduction in refined prices in 1921 and 1923. From 1925 to 1929 there was a steady decline in number of inoperative plants, but this should not be taken to indicate that these years were all prosperous for the refining branch of the industry, because by this time a great many of the plants, which had been built in the boom days of 1920, had become so obsolete that they were removed from the list. The increase in number of inoperative plants from 54 on January 1, 1930, to 89 on Januay 1, 1931, again reflected unsatisfactory conditions, for although the price of crude was low, the price of gasoline was relatively lower.

The results of this survey are given in Information Circular 6485, which lists all petroleum refineries, giving data as to location, daily capacity, and type of plant. Copies of this circular may be obtained from the United States Bureau of Mines, Department of Commerce, Washington, D. C.

Survey of Black Bass Areas Shows Interstate Law Is Being Obeyed

The enforcement of the provisions of the new law, enacted by Congress at the last session, for the protection of black bass in the streams of this country is being conducted in a liberal way pending the acquainting of the people with the law and its purposes, Talbott Denmead, Enforcement Officer of the Federal Bureau of Fisheries, stated orally August 6. Mr. Denmead is just back from a tour of inspection and conference in the Central West and will leave Washington August 9 for a series of conferences with conservation officials in various States in the South as far as Alabama.

The black bass law, in effect, prohibits the interstate shipment of black bass when the fish are illegally taken. Mr. Denmead said that so far no cases have been instituted that involve prosecution as a result of violation of the law, although there have been a number of reports of violations. He said it is the Government's policy to warn violators and that while the people are getting acquainted with the provisions of the new law drastic action will be deferred.

Mr. Denmead recently returned from an inspection of conditions at the Keokuk Dam on the Mississippi River, near Keokuk, Iowa, and he conferred also at Vincennes and Indianapolis. At Indianapolis he discussed the new law with Walter Shirts, superintendent of the State Division of Fish and Game and in Ohio he conferred with J. W. Thompson, Commissioner of the State Division of Conservation. All of these State officials, he said, assured their co-operation with the Federal Government in enforcing observance of the new law.

His southern tour of inspection, he said, will include the following:

North Carolina, conference with J. W. Harrelson, Director of the Department of Conservation at Raleigh; South Carolina, conference with A. A. Richardson, Chief Game Warden; Georgia, conference with Peter S. Twitty, Game and Fish Commissioner. He said he will ask the co-operation of these State officials in enforcement of the black bass law.

In Alabama, he said, he will confer with W. T. McDaniel and Postmaster C. M. Willis at Athens, Ga., regarding conditions at the Wilson Dam. They have made complaint, he said, that change in the water level in the Wilson Lake above the Wilson Dam during the spawn season has resulted in the destruction of millions of fish eggs and young fry. The bass lay their young in two feet of water and change in the level of the water is destructive to the young fish. He said that after he returns to Washington from a first-hand observation of the situation there he may take up the protests with the War Department. He is also going to confer with Howell Bunting, State Game and Fish Warden of Tennessee.

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New Mexico's Game Refuge System

By ELLIOTT BARKER
State Game Warden, State of New Mexico

Over production of game on some of the big game refuges of the State is presenting a problem to the State Game Commission.

Up to the present time the main thought has been conservation. The production everywhere of more game has been the goal sought. Little thought has been given to the possibility of overproduction, as such a thing a few years ago, to most sportsmen, seemed preposterous.

New Mexico has now reached a stage where overproduction and consequent overstocking of certain areas is a vital problem. The State as a whole is yet far below what it should be in all species, and it will require many years to produce on all suitable areas the amount of game they should support. Many fine ranges are barren. Restocking must be carried on by transplanting from fully stocked areas.

It is obvious, therefore, that we must break loose from the restricted idea of conservation and embark upon a broader plan of game management. Game management must take into consideration the proper distribution of game species, maintenance of adequate cover and food supply, limiting of shooting to the available annual crop of game, removeal of game of either sex whenever individual ranges become overstocked, and the control of predatory animals.

On some of the ranges grazing of both deer and livestock have produced a condition approaching a food famine.

Unless heavily overstocked, livestock and deer can share the same range without seriously encroaching upon each other's food supply, since livestock graze chiefly on grass, and deer feed chiefly on the brush.

But livestock also feed partially on the brush, in fact, concentrating on brush in the spring of food in some game refuges, and both the deer and dry seasons, which has produced the shortage and the cattlemen are faced with solving the food shortage.

It has been proposed that deer of both sexes be subject to the open season. This may be done in some districts where deer are too plentiful. until the game is reduced to the range's normal carrying capacity.

An attempt to trap and transplant deer from overstocked ranges to ranges where deer are scarce has been made, but the effort to date has has not proved successful.

The Department has taken the position that in no plan of management can reduction of excess numbers of deer or other species of game be secured by permitting an increase in predators. To do so would later involve excessive expense in recontrol, and perhaps unduly reduce or even annihilate other resident species.

New Mexico's game refuge system has proved a great success in stocking adjacent areas with overflow from the protected areas, thus permitting fine hunting for the sportsmen without depleting the source of supply.

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Decrease in Supply of Migratory Waterfowl

By BURNIE MAUREK
Game and Fish Commission, State of North Dakota

The critical situation facing the wild ducks in the breeding areas of North Dakota, and the western Canadian Provinces, was responsible for a conference held in Bismarck on July 18. The action taken at this meeting may have a rather far-reaching effect on the open season on ducks this year.

This meeting was called by the Game and Fish Commissioner, and those in attendance were T. W. Laidlaw, Assistant Deputy Minister of the Department of Mines and Natural Resources of Manitoba; S. E. McColl, Director of Surveys of the same Department; Thomas N. Marlowe, chairman of the Montana Game and Fish Commission; W. D. Stewart, Game and Fish Commissioner of Minnesota; and Fred H. Hildebrandt, Charles Boreson, A. G. McBride, Pat Adams, Commissioners of South Dakota, and Oscar H. Johnson, Director of Game and Fish of South Dakota.

The plight of the migratory waterfowl, and especially wild ducks, was discussed from many angles, and the final result of the conference was the unanimous approval of a resolution calling for a 30-day open season on ducks throughout the United States and Canada, with a bag limit of 10, and a possession limit of 20 ducks, and the prohibition of shooting over baited grounds.

Copies of these resolutions have been transmitted to the President of the United States and the Secretary of Agriculture, as well as to the proper governmental officials of the Dominion of Canada.

While these resolutions may appear drastic in some of their provisions, yet the situation existing in the breeding areas of the wild ducks is so serious that unless some prompt remedial measures are put in force the number of wild ducks will be reduced to a point never known. The unprecedented drought conditions prevailing in the Northwest this season have reduced the hatch of young ducks to a figure estimated as high as 80 per cent by experienced observers. This Department has received numerous letters from various parts of the State urging a shorter season on ducks, and in many instances the writers favored a closed season.

It is a striking coincidence, that on the date of the conference in Bismarck, and without any previous arrangement with the Commissioners of the North Central States, the Commissioners of the western Canadian Provinces met at Edmonton and adopted a resolution favoring a 30-day open season onducks. However, this action was taken only after a survey had been made of the situation in the duck-breeding areas of Canada, and the conditions found to warrant immediate relief measures.

Duck Hunters Asked to Regard Future of Nation's Waterfowl

The future of the waterfowl, in a large measure, depends upon whether sportsmen this year will be considerate in their duck shooting, or whether "slaughter is the rule," Paul G. Reddington, Chief of the Biological Survey of the Department of Agrculture, declares in a statement issued by the Department on Oct. 1, the opening of the duck season in many localities.

The statement follows in part:

"When the one month's duck season opened at 12 o'clock noon yesterday (Oct. 1) in most of the Northern States, many thousands of duck hunters were in their blinds. These and those others who shoot later have a fateful decision to make, said Paul G. Reddington, Chief of the Biological Survey, which is the agency of the Department of Agriculture charged with the protection of migratory game birds.

"Will they, he asks, spare some of the ducks because of the unimpeachable evidence that many species are scarcer than ever before, due to the cumulative drought, drainage, and overshooting? Or will they cast aside all consideration for the plight of the birds and kill the limit whenever it is possible on every day of the month allowed for shooting? He predicted that if the real sportsmen are in the ascendency, many birds will fly back next spring to their nesting grounds in the North, but that if the contrary should be the case, the spring flights will be only a reminder of the mighty hordes the old-time hunters used to watch."

"The issue is drawn," says the Chief of the Biological Survey, "and in large measure the future of the waterfowl hangs in the balance. That balance may be swayed for good or ill, as considerate treatment is accorded the birds or as heavy slaughter is the rule.

"By comparison with former seasons, the ducks on their southern trek will find great tracts of waterless land. They will fly longer and farther and will concentrate on those areas—for these are comparitively few—that will furnish needed rest and food."

Rare Species of Sea Life Found By Navy's Solar Eclipse Party

"One of the most important discoveries of the last 100 years in the field of shallow-water sea-urchins" is the description given by the Smithsonian Institution to findings made by Lieut. Henry C. Kellers, Medical Corps., U. S. N., while a member of the solar eclipse expedition to Niaufou Island, in 1930, specimens of which were delivered to the Institution.

The Institution's praise of Lieut. Kellers' work was expressed in a letter received by the Department of the Navy, and made public July 31.

A number of other interesting and valuable discoveries were made by Lieut. Kellers while a member of the Naval Observatory Expedition, among which was a type of wood, growing in the lava deposits of the island, so hard that tools of the Observatory were blunted in attempts to cut it. Particles of it sank like rock in water, the Department said.

The Department's statement follows in full text:

"While with the solar eclipse expedition from the United States Naval Observatory, based at the island of Niuafou, 300 miles southwest of Samoa, during 1930, Lieut. Henry C. Kellers, Medical Corps, U. S. N., obtained some very interesting specimens of animal life for the Smithsonian Inetitution, which speaks of them as 'important discoveries',"

The National Museum, which received the various specimens, has written to the Navy Department praising the work of Lieut. Kellers.

The National Museum states that thanks to Lieut. Kellers' labors, they are now in possession of several rare species of which adequate representation was heretofore lacking, and of large series of other forms, which, because of the absence of sufficient materials in the museums of this country and of Europe, have not been properly understood.

The letter from the National Museum explains:

"More important than this, however, is the discovery by Lieut. Kellers of one of the most remarkable new genera of sea-urchins that has ever come to light—a curiously generalized form from which three wholly dissimilar types might possibly be assumed to have radiated. ,

"The first species of Heterocentrotus was described in 1705, and the genus itself was described in 1835. The first species of Colobocentrotus was described in 1758, and the genus was described in 1835. The first species of Echinometra was figured in 1554, and the genus was described in 1825.

"The discovery of a wholly new and unexpected type among these animals, especially a new type belonging to a group (the family Echinometridae), the other outstanding types of which have all been known since 1758, can not but be regarded as most unusual.

"It is no exaggeration to say that Dr. Kellers' discovery of this interesting creature is one of the most important discoveries that has been made in the well-worked field of shallow water sea-urchins in the past 100 years.

"The significance is emphasized by the fact that Lt. Kellers discovered not a single species, but two quite distinct species."

The Smithsonian Institute has named these new sea-urchins Zenocentrotus, and the two included species are Zenocentrotus kellersi, and Zenocentrotus paradoxus.

The Superintendent of the Observatory, Capt. Julius F. Hellweg, U. S. N., requested Lieut. Kellers to bring some samples of odd wood from the island of Niuafou, with the result that among the 120 odd cases that returned from Niuafou were four cases containing a type of wood which grows in the lava on the island of Niuafou.

In attempts to cut this wood, the tools of the Observatory were blunted and dulled. The specimens of the wood were then turned over to the Smithsonian Institution, which reports that cutting and polishing the wood would be extremely difficult, due to some substance in it which very rapidly wears away the cutting edge of all instruments.

It took three men to carry one piece of wood upstairs, although the piece was only about 5 feet long and 6 or 8 inches in diameter. When a small piece was thrown into water, it sank like a rock.

Lieut. Kellers is now on duty as medical officer at the Navy Recruiting Office, Providence, R. I. His home address is: 58 Rutledge Avenue, Charleston, S. C.

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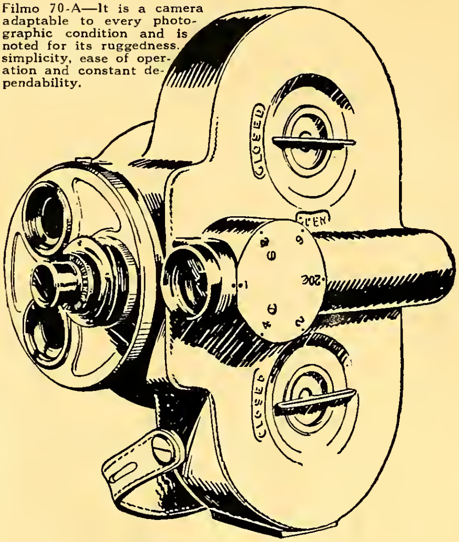

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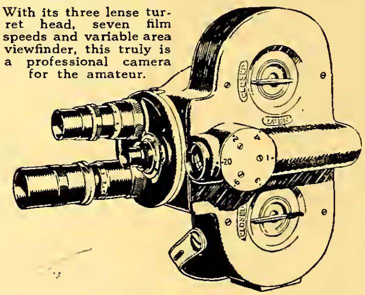

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